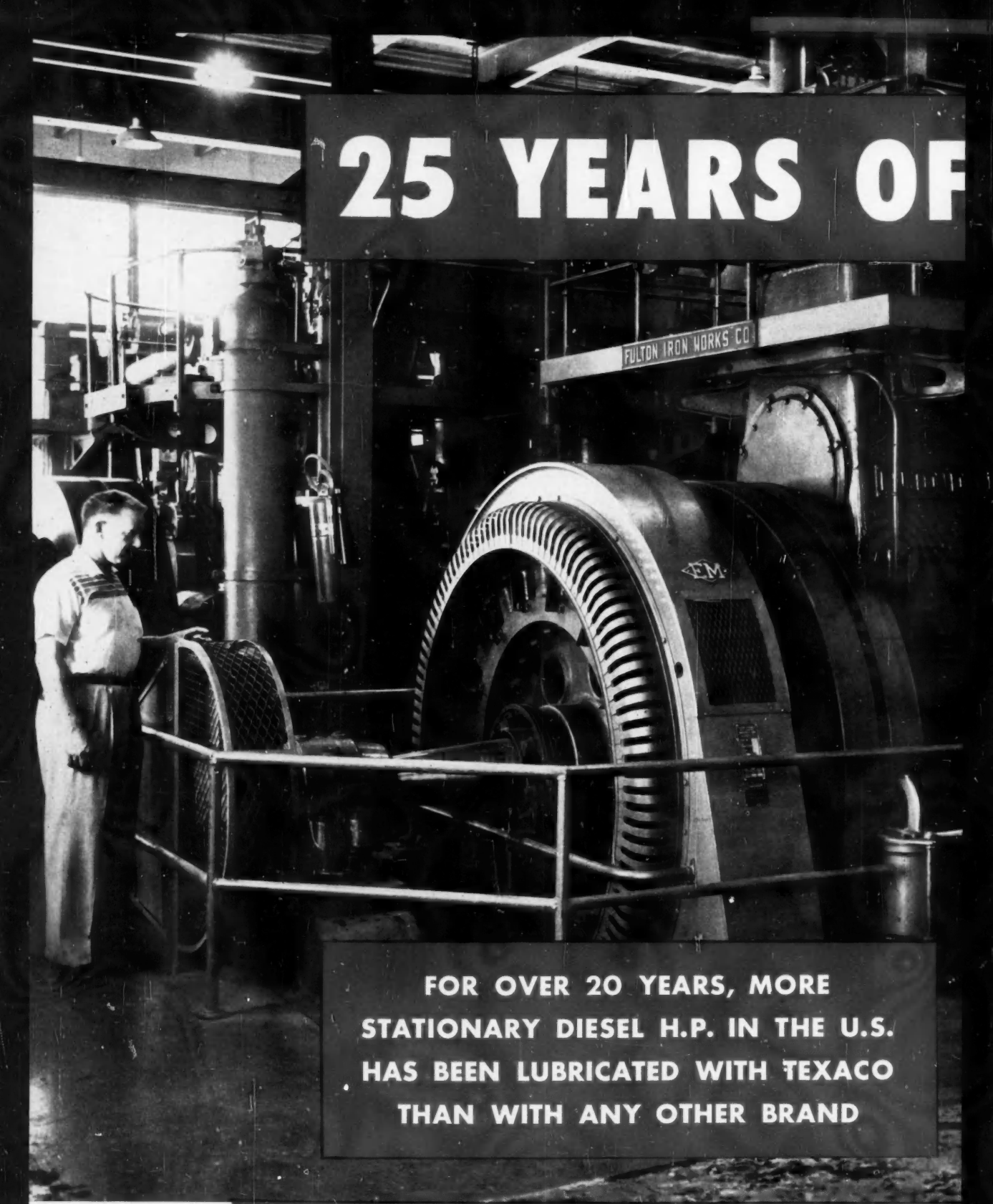
diesel power

December 1955

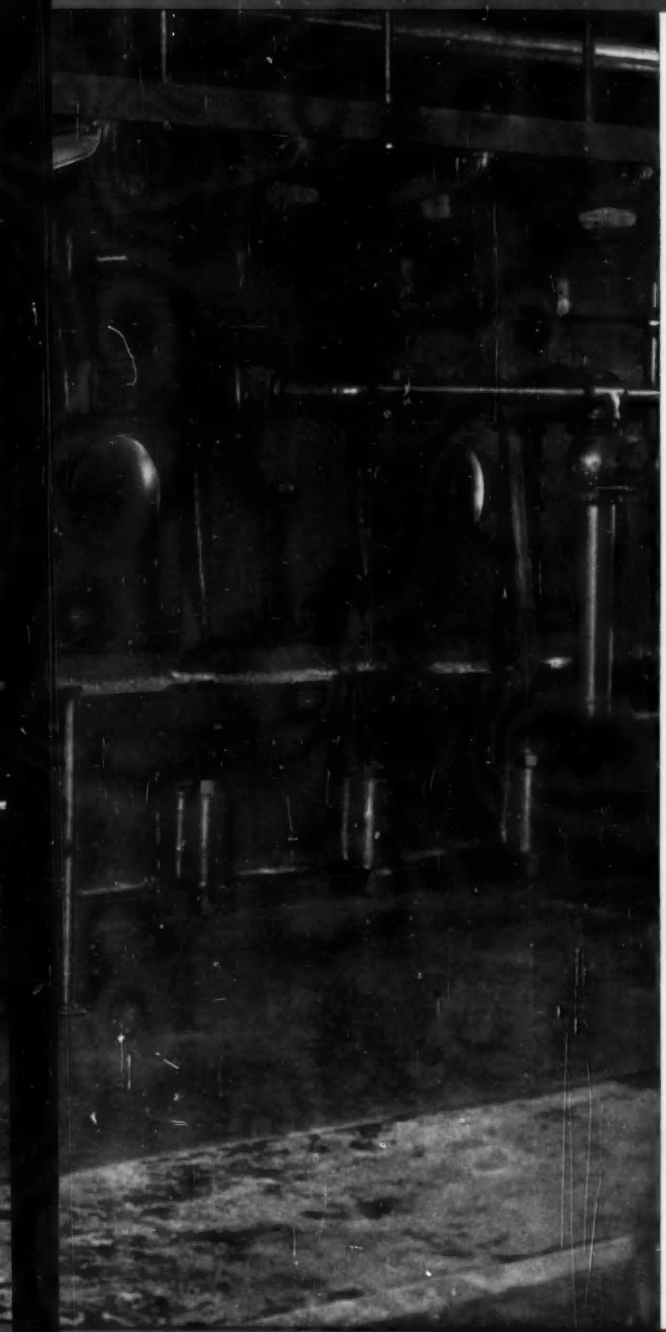

25 YEARS OF
FULTON IRON WORKS CO.
E.M.
FOR OVER 20 YEARS, MORE
STATIONARY DIESEL H.P. IN THE U.S.
HAS BEEN LUBRICATED WITH TEXACO
THAN WITH ANY OTHER BRAND

TUNE IN:
TEXACO STAR THEATER
starring
JIMMY DURANTE
on TV Saturday nights.
METROPOLITAN OPERA
radio broadcasts
Saturday afternoons.

TEXACO
REG T.M.

TEXACO

MINIMUM COSTS



HERE'S a report from Merle D. Geving, Superintendent of Le Sueur, Minnesota, Municipal Utilities, about his plant's 25-year experience with *Texaco Ursa Oil:*

> **"We started using *Texaco Ursa Oil* with our first diesel — installed in 1930. It gave us such fine lubrication — clean operation, no harmful deposits, no stuck rings, minimum wear — that we naturally chose *Texaco Ursa Oil* for each of the four other engines installed since.**
>
> **"Today, we operate three straight diesels and two dual-fuel engines, and *Texaco Ursa Oil* is in the crankcases and cylinders of them all. We consider this an important factor in keeping maintenance and operating costs at an absolute minimum."**

Your plant, too, can enjoy these benefits. There is a complete line of the famous *Texaco Ursa Oils* especially refined and processed to make diesel, gas and dual-fuel engines deliver *more power* with *less fuel* over *longer periods* between overhauls.

Let a Texaco Lubrication Engineer help you. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

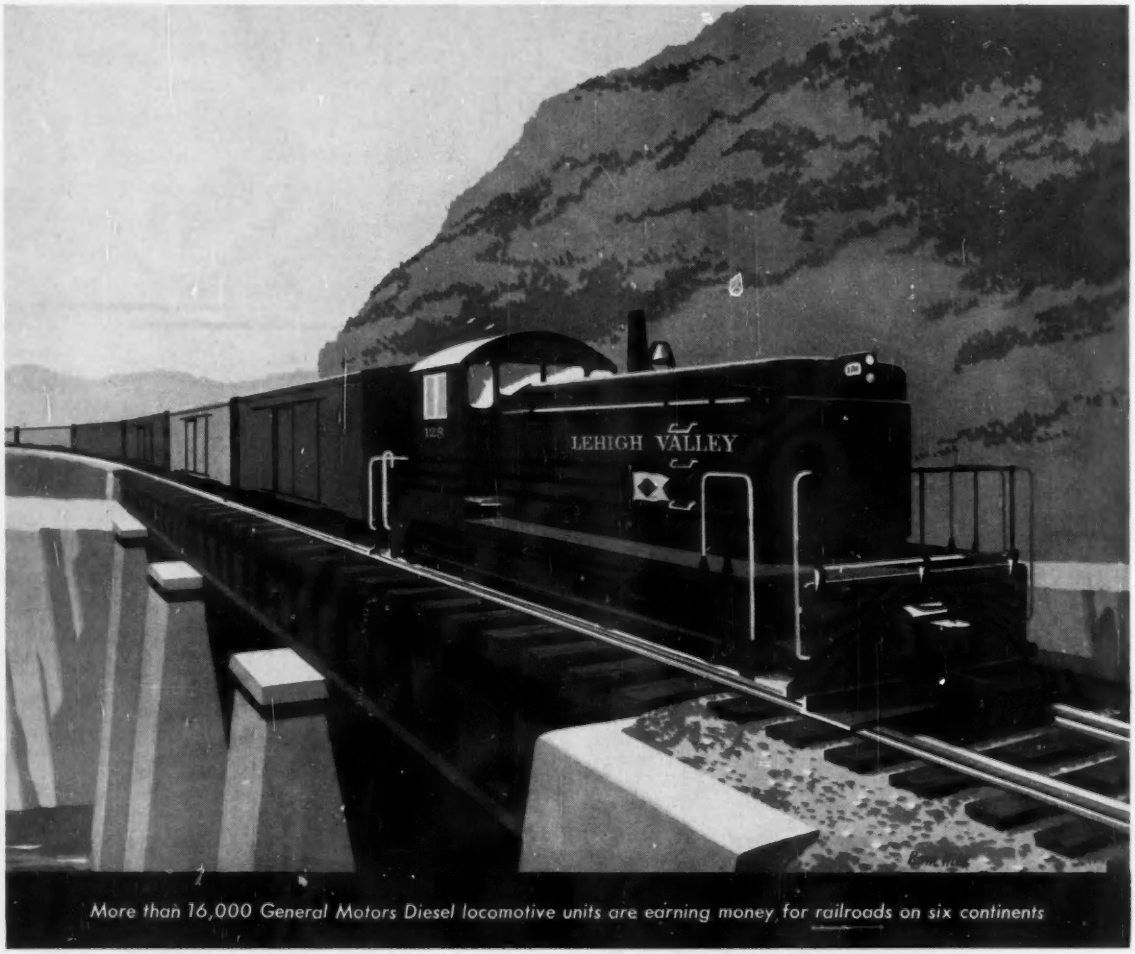
The Texas Company, 135 East 42nd Street, New York 17, N. Y.

URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

15 Years Old

—and better than new

Recently upgraded by Electro-Motive, this General Motors switcher had already delivered 15 years' faithful service on the Lehigh Valley. Now it's back better than new. Modernization of these older locomotives includes remanufacture of electrical rotating equipment, new controls and replacement of the original 12-201A engine with a modern 8-567C Diesel. In the modified SW9, *eight cylinders do the work of twelve*—and that means lower cost.



More than 16,000 General Motors Diesel locomotive units are earning money for railroads on six continents

La Grange, Illinois • Home of the Diesel Locomotive GENERAL MOTORS LOCOMOTIVES *In Canada:* GENERAL MOTORS DIESEL, LTD., London, Ontario

ELECTRO-MOTIVE DIVISION · GENERAL MOTORS

SCHWITZER
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INDIANAPOLIS, INDIANA
SCHWITZER-CUMMINS
for 37 years
FANS
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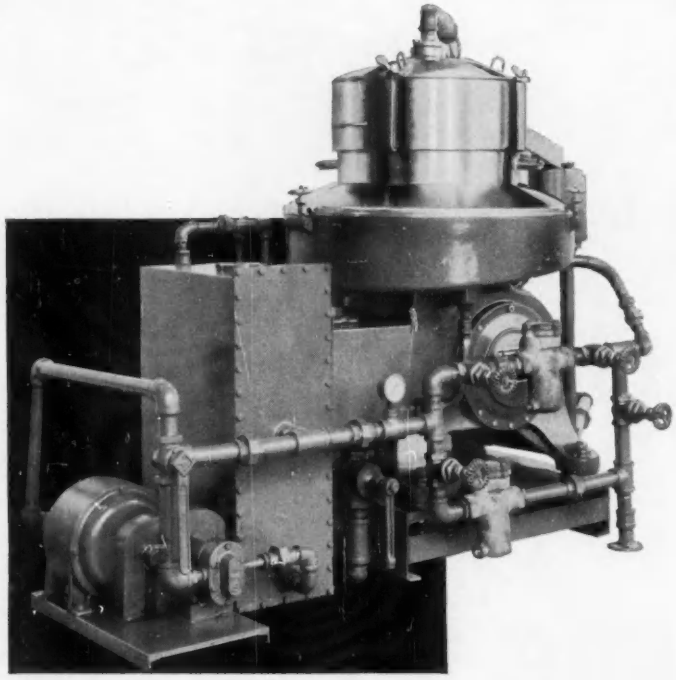
Unlock the BTU'S in BUNKER "C" with a Sharples CONTINUOUS HEAVY OIL PURIFIER



You can cut your diesel fuel costs drastically by burning residual oils—diesel engines thrive on it when the Sharples Purification unit has removed the unburnables.

And additional savings are yours too —because the continuous Sharples eliminates the costly headache of frequent bowl cleanings.

Get the facts and convince yourself of the tremendous savings possible—savings that others are enjoying year in and year out. Write Sharples today.

SHARPLES

THE SHARPLES CORPORATION
2300 WESTMORELAND STREET • PHILADELPHIA 40, PENNSYLVANIA
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Associated Companies and Representatives throughout the World

editors notes...

You'll want to read about...

A "first" for our country———— a turbocharged 2-cycle diesel with completely self-sustained turbocharger operation. We have this in natural gas engines but this is the first—at least that we know about—to be offered commercially. This turbocharging thing is really taking hold and "you ain't seen nothing yet" . . . .

The turbocharger used on the new 2-cycle engine. This one was imported from Great Britain and from all accounts is doing a fine job. We've covered some major points of construction and design to show their thinking on the subject . . . .

What makes a trucking firm go "whole hog" in replacing their gasoline-powered rigs for diesels —and come up with one of the biggest equipment orders in some time? And in our "capitalistic" system (for which thank God) the best incentive is profit. Maybe the factors that influenced Yellow Transit apply to you too . . . .

Dual-fuel operation saves money too. The diesel's cosmopolitan appetite for fuels is one thing that keeps users in the black. And if you are using gas now, how does your plant stack up with Garland and its performance with modern engines . . . .

How to predict liner costs for bare and chrome-plated cylinder bores. Here are some ideas about how to figure the possible saving to you on a long-range basis . . . .

diesel power

Established in 1923 **Vol. 33, No. 12** **December, 1955**

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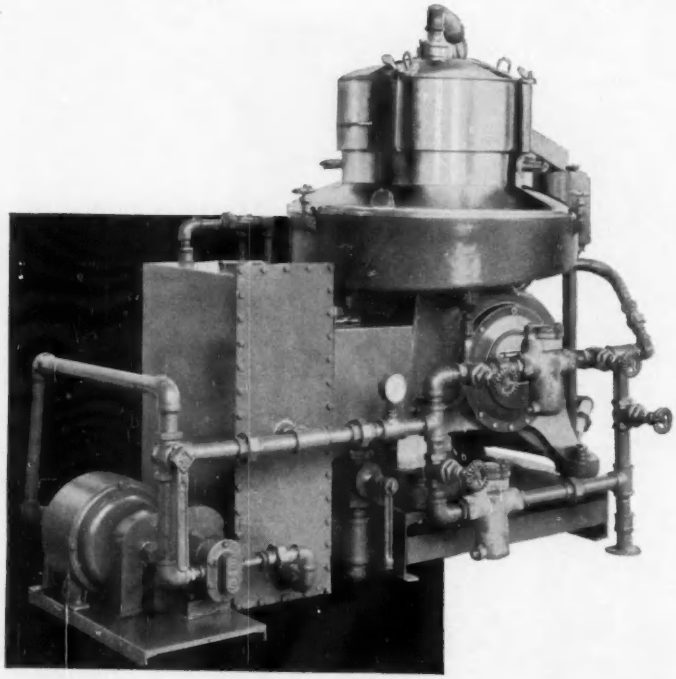
CONTINUOUS HEAVY OIL



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2300 WESTMORELAND
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Associated Companies

You'll want to read about...

An engine rebuilding shop built around the idea of customer service. Good work—and fast—with never a look at the clock is normal here. Although this operation is somewhat unique, take a good look; you're bound to get some profitable ideas you can adapt . . . .

A new railroad shop and some good public relations. When you have something good, let the people most concerned learn about it at first hand . . .

More ideas on finding out when to change lube oil and filters. Here is how one bus operation lowers maintenance $$$ while at the same time improving their operation . . . .

Licking the rust problem when storing parts and assemblies. Are you sure you know all the materials available and where they can be used to best advantage at least expenditure of time and money . . . .

Some highlights of Worthington's new W9 high-output engine. Here is another foretaste of what's ahead through turbocharged design . . . .

Of course, you'll want to read all the features. Milk this issue dry soon because we'll have more profitable ideas lined up to start the New Year. Which brings us to—

MERRY CHRISTMAS

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Newspaper Representation Ltd.
British Representative
231 Strand,
London, W. C. 2, England

Georg J. Linder
German Representative
Wittelsbacher Allee 60
Frankfort/Main, Germany

Publisher
G. Renfrew Brighton

Assistant Publisher
Wilbur W. Young

Subscription Rates

	Single Copies	1 year	2 years	3 years
U. S.	35¢	$3.00	$5.00	$ 6.00
Canada	35¢	3.00	5.00	6.00
Foreign	40¢	5.00	8.00	11.00

Diesel Power is indexed regularly by Engineering Index, Inc. and is available in microfilm editions from University Microfilms, Inc., Ann Arbor, Michigan.

DIESEL POWER for December, 1955. Vol. XXXIII, No. 12. It is published monthly by **DIESEL PUBLICATIONS, INC.**, Executive and Editorial Offices at 192 **LEXINGTON AVE., NEW YORK 16, N. Y.** Tel. MUrray Hill 3-9874. Entered as second class matter at the Post Office, Kutztown, Pa., under Act of March 3, 1879. Copyright 1955, Diesel Publications, Inc.

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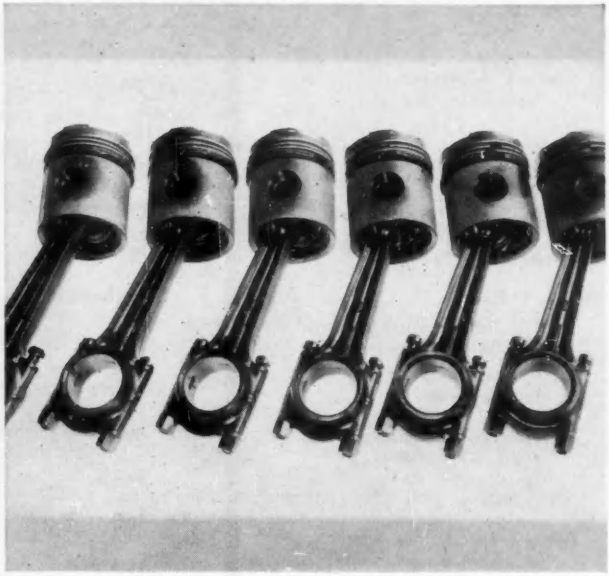
The Engineer's Field Report

CASE HISTORY
RPM Delo Oils
LUBRICANT
Illinois-Calif. Express Co.,
FIRM Los Angeles, Calif.

Long-haul diesel runs 217,674 extra-tough miles with only 0.003″ liner wear



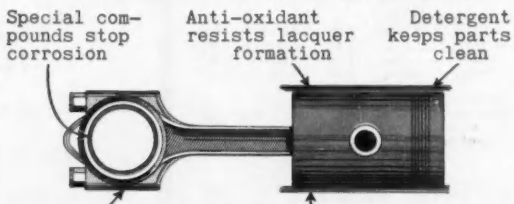
THIS DIESEL piled up 217,674 tough miles in fast freight hauling through hot desert temperatures and mountain freezes. A cracked block sent tractor in for its first overhaul. When engine block cracked in Prescott, Arizona, rig made remaining 517 miles into Los Angeles with water leaking into crankcase. Despite water in oil for this distance and wide range of operating temperatures in regular service, liner wear was only 0.003", all pistons, rings (above) were clean and free of deposits. Even the bearings were still intact. Illinois-California Express Co. uses RPM DELO Lubricating Oils in this and all their fleet of diesel trucks.

RPM DELO LUBRICATING OILS

TRADEMARK "RPM DELO" REG. U. S. PAT. OFF.

FOR MORE INFORMATION about this or other petroleum products, or the name of your nearest distributor, write or call any of the companies listed below.

Why RPM DELO Oils prolong engine life

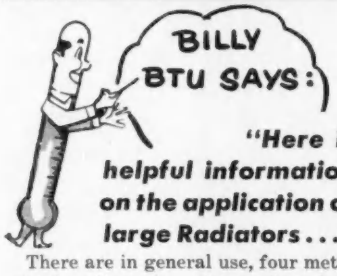

Special compounds stop corrosion
Anti-oxidant resists lacquer formation
Detergent keeps parts clean
Inhibitor resists foaming
Metal-adhesive qualities keep oil on parts in running or idle engine

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

Young Heat Transfer News

YOUNG RADIATOR COMPANY, RACINE, WIS.

Ford Dissipates Quench Oil Heat with Young Evaporative Coolers



"Here is helpful information on the application of large Radiators . . ."

There are in general use, four methods of cooling a large internal combustion engine with a Radiator.

The most common method is to use a single stream of water through a Radiator.

The second most common method is to use a portion of the Radiator to cool the lubricating oil directly.

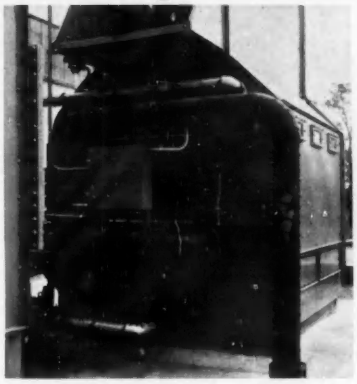
The third most common method of temperature control is to use two separate streams of water each through a separate portion of the Radiator. One stream is engine jacket water, and the other is used through a shell and tube lubricating Oil Cooler.

The fourth method of cooling is used where one large Radiator must cool several engines of various makes or models. This method consists of cooling a single stream of water through the Radiator to a rather low temperature and passing this water through several shell and tube Coolers to cool the lube oil and jacket water for each engine in separate Coolers.

For further details, see Booklet offer below, or contact Young Radiator Company, Department M-415, Racine, Wis.

RADIATORS FOR STATIONARY ENGINES BOOKLET AVAILABLE FOR DESIGN ENGINEERS

A 16-page Booklet prepared by a leading Young Radiator Company design engineer discusses four methods of cooling internal combustion engines with a Radiator. Material includes schematic drawings, pictures and sample specifications. Price, 50¢. Write for Bulletin 2136 to: Young Radiator Company, Racine, Wisconsin.



Heating element wrapped around oil lines serving YEC.

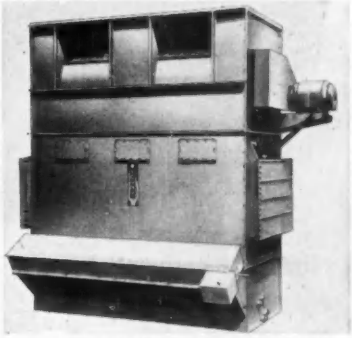
Rear view shows convenient observation ports.

Transmission Plant's Heat Treat Operation Completely Automatic

Ford Motor Company's transmission plant, Livonia, Michigan, is equipped with two Young Radiator Company Evaporative type Coolers. Set up for completely automatic operation, the Young Coolers reject quench oil heat in the heat treating department. Because the cooling units are installed out-of-doors, oil lines are wrapped with heating elements and water lines are fitted with steam jets to prevent freezing in winter.

Young Evaporative Cooler moisture eliminators separate entrained water from the vapors and return water to the Cooler pumps. Thus, only vaporized water is lost by discharge in the air stream.

Versatile YEC Units meet a variety of cooling and condensing problems. By varying the basic design slightly, economical standard units can be adapted to cool engine jacket water, lubricating oil, natural gas, and condense steam, hydrocarbons and other gases . . . at operating pressures ranging from 100 to 2000 psig. For further details write for free Catalog No. 1952 to Department M-415, Young Radiator Company, Racine, Wisconsin.



Rear view showing several access panels in oil sections.

Young RADIATOR COMPANY

RACINE, WISCONSIN

Creative HEAT TRANSFER ENGINEERS FOR INDUSTRY

Heat Transfer Products for Automotive, Aviation and Industrial Applications. Heating, Cooling, Air Conditioning Products for Home and Industry.

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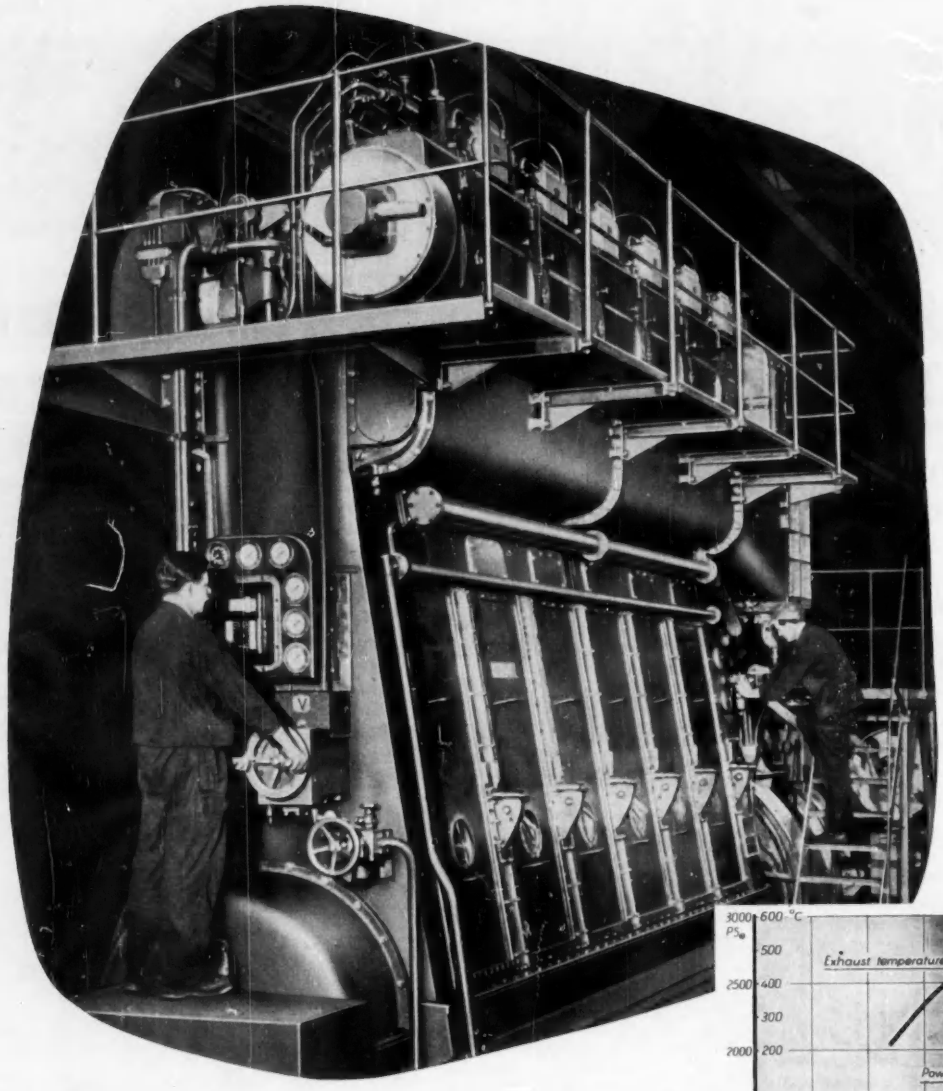
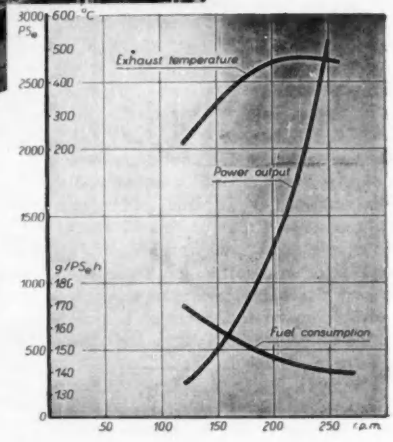




High Supercharging and Heavy Fuel Oil Operation

The KV engine type with high supercharging is built for highest economy. It has an extraordinarily low fuel consumption. The crosshead design renders this engine particularly suited for the combustion of heavy fuel oils. After long workshop tests this engine has proven its entire reliability as main marine engine in practical service.

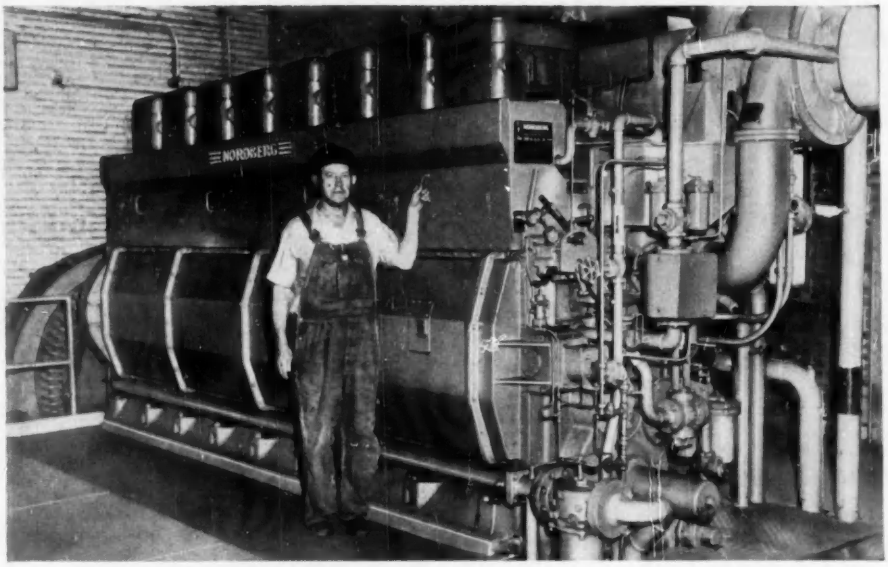
M·A·N

MARINE DIESEL ENGINE

MASCHINENFABRIK AUGSBURG-NÜRNBERG AG. · WERK AUGSBURG

Represented in all countries

This engine maintains a lubricating oil economy of approximately 18,000 H.P. hrs. per gallon



Koppers Porous Chrome* Rings. Porous chrome surface holds and distributes oil during break-in. Seats quickly. Chrome prevents grit from embedding in ring surface. Prevents cylinder wall scratching. Reduces wear 50%. Lasts 4 times longer than other rings.

Here's operating efficiency as it has been proved at the Municipal Power Plant, Lindsay, Oklahoma.

A lot of the lubricating oil economy can be credited to the piston rings installed in this Nordberg Duafuel engine. They are Koppers American Hammered Piston Rings. (Porous Chrome*, Tapered O. D., and Grooved Oil Cutter Rings.)

Many manufacturers of diesel and pumping machinery insist on Koppers Rings for their equipment because they know that Koppers Rings make for satisfactory performance.

Test after test also prove that, when Koppers Rings are used for replacements, operating efficiency, and economy are markedly increased . . . often doubled. And Koppers Rings last so much longer that labor costs and costly down-time for repairs are greatly reduced.

So, to save on lubricating oil, to cut down costs, to help save on fuel, remember Koppers. Next time you have an overhaul, think of Koppers first. We are always ready to consult with you on your specific piston ring problems. And for the latest information on Koppers Rings, mail the coupon below.

Koppers Oil Cutter Rings maintain high unit pressure on the oil film. Seats rapidly. Slots in back of ring permit oil collected in channel on down stroke to flow into interior of piston. Proved efficient in thousands of installations. Extremely popular in vertical compressors and internal combustion engines.

*Van der Horst Process

KOPPERS®

AMERICAN HAMMERED
Industrial Piston Rings

METAL PRODUCTS DIVISION • KOPPERS COMPANY, INC. • Baltimore, Maryland
This Koppers Division also supplies industry with Fast's Couplings, Aeromaster Fans, Koppers Electrostatic Precipitators and Gas Apparatus.
Engineered Products Sold with Service

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Gentlemen: Please send me free 16-page booklet containing full information on Piston Rings.

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SOLVE vibration • movement • expansion problems

SIMPLIFY offset connections

REDUCE maintenance ...in diesel exhaust, air, oil and water piping

In diesel engine piping systems, American flexible metal hose offers a practical solution to problems of vibration and expansion, the principal reasons for accelerated failure of rigid pipe. It's simpler to install, too. You *bend* it into position, saving time on the job and making easy work of fitting offset connections.

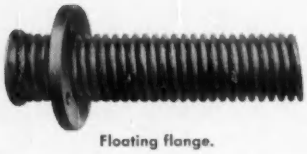
For heavy-duty exhaust and air intake lines, specify American Flexible Steel Corrugated Hose. It adjusts to expansion and dampens engine vibration, preventing excessive stress on exhaust manifold flange bolts and fittings. Vibration dissipates in the hose and is not transmitted to adjacent structural members. Assemblies are supplied complete with floating flanges to simplify lining up with companion flanges.

To convey air, oil and water, use American Seamless Flexible Metal Tubing. Made in bronze or carbon steel for standard service, and in stainless steel or Monel for special service. Tubing has woven wire braid covering for added strength. Complete assemblies include fittings.

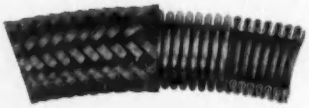
55199

Type Y-10 flexible, corrugated exhaust hose assembly with floating flange, left, and fixed flange. ID's 2" through 16".

Type Y-10 hose with welded nipple, supplied with or without flange.

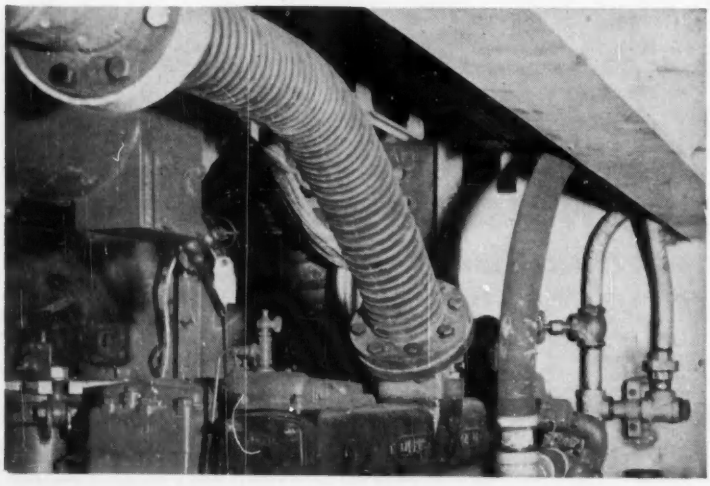


Floating flange.



Type S-1 braid-covered seamless flexible metal tubing for air, oil and water lines. Seamless tubing is 100% tight and extremely flexible. ID's ⅛" through 12". Usually furnished with fittings attached.

Below: Flexible, corrugated steel hose carries hot diesel exhaust gases to atmosphere.



WANT MORE INFORMATION? Bulletin EH-50 gives detailed engineering data on American flexible metal hose and tubing for diesel engines. We'll be glad to send you a free copy, or have one of our sales engineers call. No obligation of course. Address *The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn.* In Canada: *The Canadian Fairbanks-Morse Company Ltd.*

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AMERICAN

FLEXIBLE METAL HOSE AND TUBING

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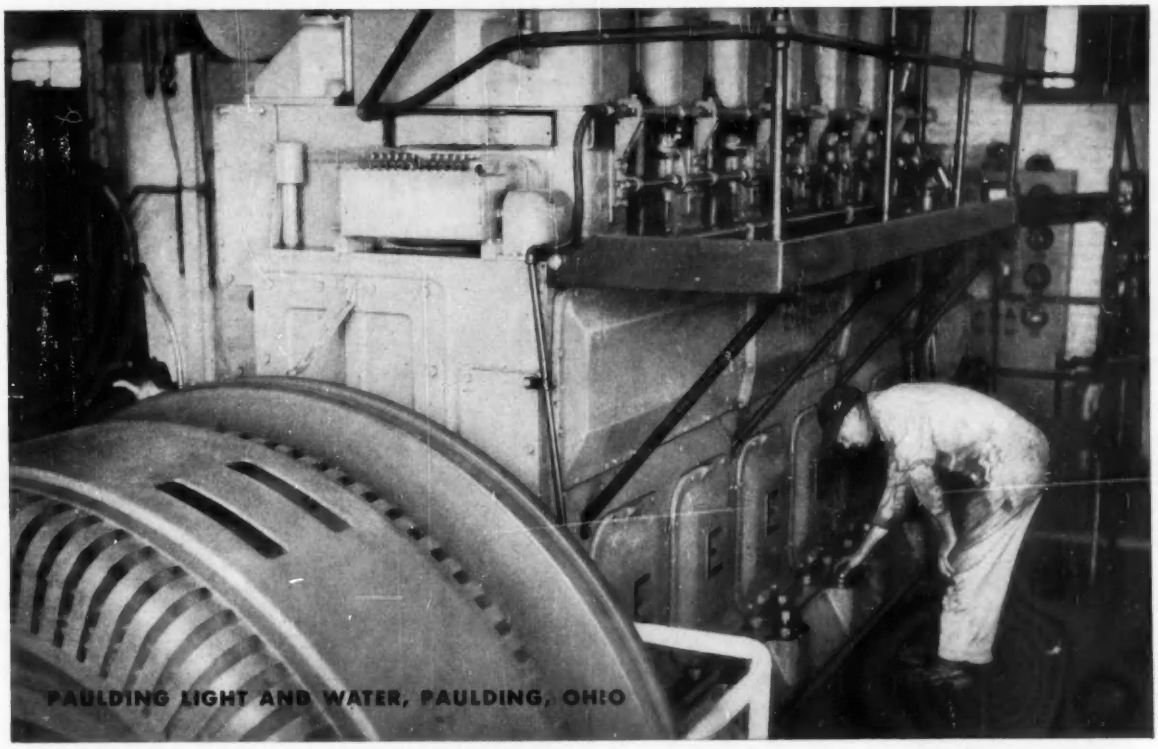


"16,587,402 H. P. hours without oil change using Cities Service C-300 Lube Oil!"

1000 KW Enterprise uses only one gallon of oil in 23,205 BHP hours, has no oil reclaimer.

The main part of the power output of Paulding Light and Water Company is developed by its dual-fuel, 1000 KW Enterprise Unit.

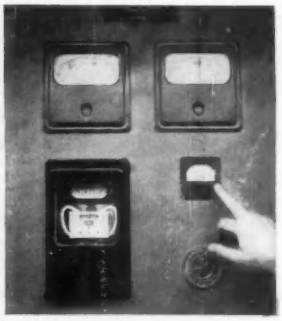
Mediocre performance can't be tolerated at Paulding . . . the power load is running twice that of seven years ago!

"Fortunately," says Superintendent James J. Leslie, "performance is tops—and much of the credit is due Cities Service C-300 Lube Oil. We really pile up hours with C-300 . . . and still get excellent engine life. I've never had the head off the Enterprise since it was first installed in 1953, yet compression, fire pressure, and fuel economy are still very good.

"We've actually logged up to 16,587,402 H.P. hours without an oil change. We use only 1.5 gallons of C-300 Lube Oil per day, which amounts to 23,205 brake-horsepower hours per gallon . . . and that's with no oil reclaimer! I'd recommend Cities Service to any power plant."

If you're interested in Mr. Leslie's recommendation, talk with your Cities Service Lubrication Engineer. He can tell you of other outstanding case histories. Or write: Cities Service Oil Co., Sixty Wall Tower, New York 5, N. Y.

Electric Service Goes Hand in Hand with Cities Service at Paulding Light & Water, Paulding's Enterprise dual-fuel power unit gets 23,205 BHP hrs. for every gallon of Cities Service C-300 Oil that's consumed. Oil changes are made about every 11,000 hrs.

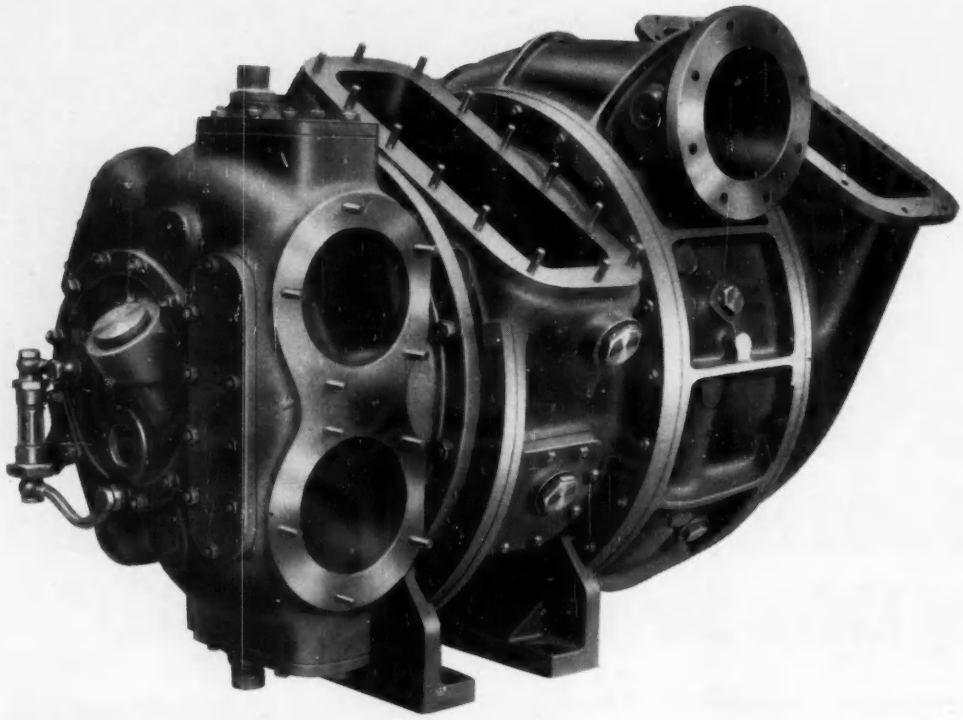


"We're Really Able to Pile Up Hours and still get good engine life using Cities Service C-300 Lube Oil," says Supt. Leslie. "I've never had the head off the Enterprise since it was installed in 1953. Compression, fire pressure, and fuel economy are excellent."

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

KAHLENBERG CHOSE *NAPIER*



Napier turbo-blowers fitted to 2-stroke Marine diesel engines are currently increasing power output by at least 30% and even more on industrial applications. Or—if you prefer it this way—with a Napier turbo-blower you can get the same amount of power from a much smaller engine. Specific fuel consumption is no higher and can often be reduced. They are available in seven sizes to suit engines of approximately 140 h.p. to 4,000 h.p. Multiple installations are available for engines of higher powers.

KAHLENBERG BROS. CO., have installed *NAPIER* Turbo-Blowers on their latest Model E6 Two-stroke, uniflow scavenged Marine Engine.

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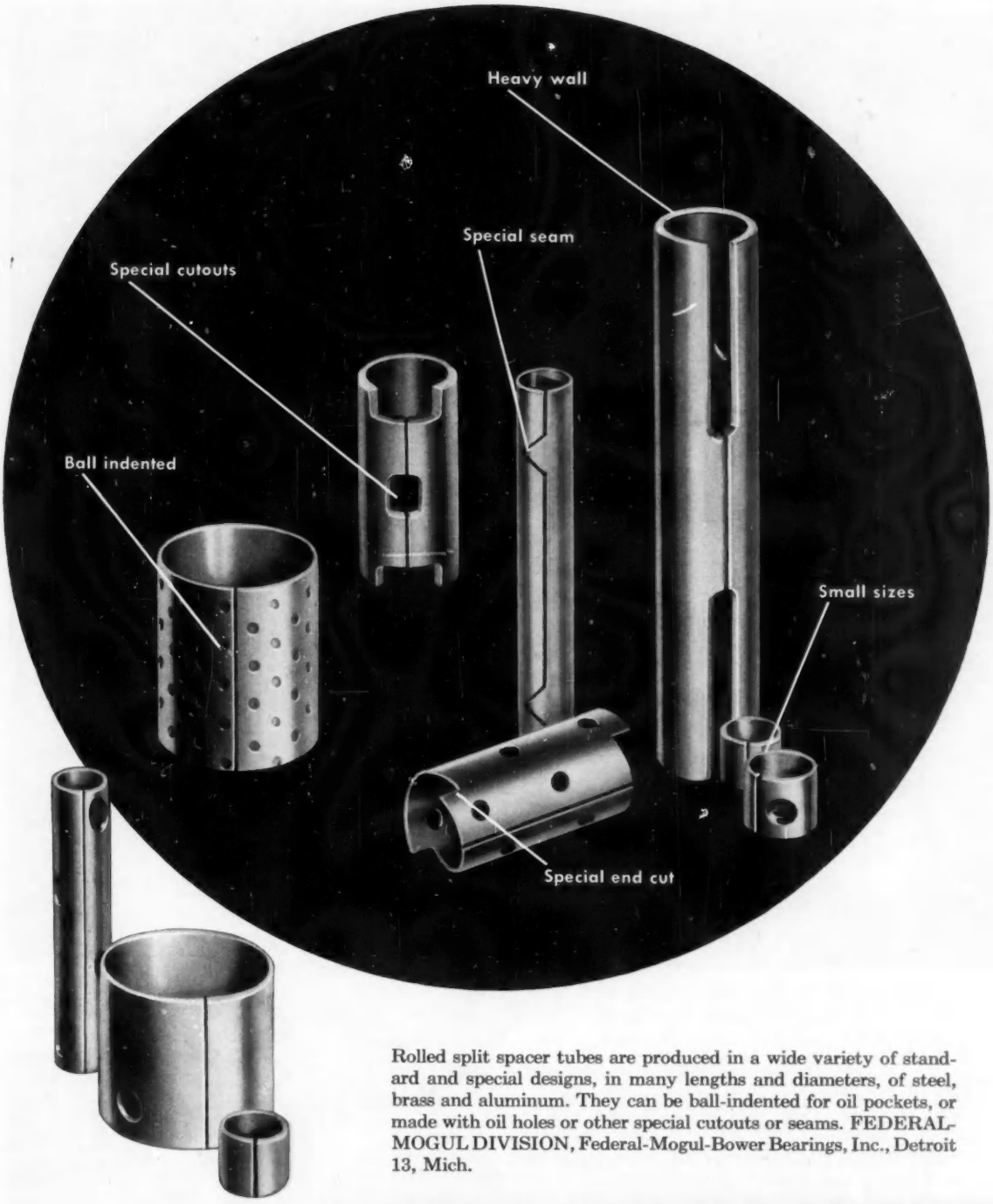
D. Napier & Son Limited. 211 The Vale, London, W. 3. | Representative: L. O. Brooks, Suite 652A, Dupont Circle Building, 1346 Connecticut Avenue, Washington 6, D. C.



Rolled split spacer tubes are produced in a wide variety of standard and special designs, in many lengths and diameters, of steel, brass and aluminum. They can be ball-indented for oil pockets, or made with oil holes or other special cutouts or seams. FEDERAL-MOGUL DIVISION, Federal-Mogul-Bower Bearings, Inc., Detroit 13, Mich.

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Sleeve bearings, bimetal rolled split bushings, plain steel or bronze rolled split bushings, bearing-surfaced washers.

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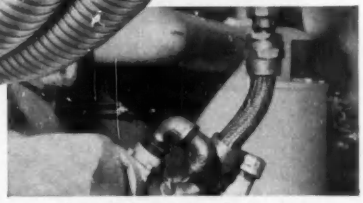
When diesels power trucks hauling 70,000 lb. loads of logs over mountain roads — or locomotives and ships, Atlantic flexible metal hose is usually given the job of guarding those vital diesel life lines—water, fuel, exhaust.

Atlantic flexible metal hose is manufactured to tough specifications.

Wall thickness is absolutely uniform. Tight against water, oil, steam, gas and air. Requires no maintenance. Atlantic flexible metal hose dampens vibration, remains flexible at higher temperatures.

There is an Atlantic flexible metal hose for each of these applications. Made in bronze, steel, stainless and monel—⅛"-36" I.D. with required fittings.



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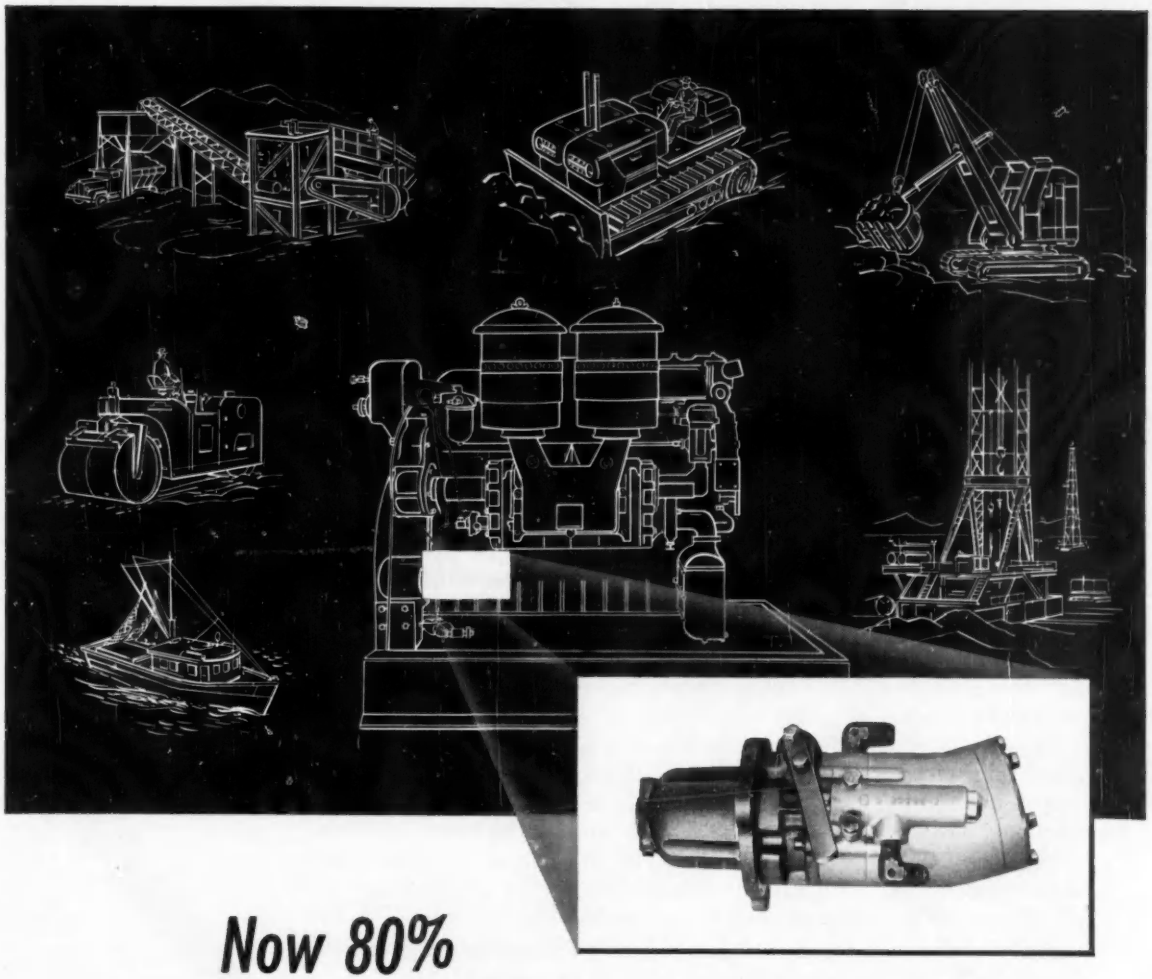

Now 80% Faster Detroit Diesel Cranking with the new Low-Cost GM Hydrostarter

TESTS PROVE that a Hydrostarter gets a General Motors Detroit Diesel up to starting speeds 80% faster than regular starting systems.

That means fast, sure starts anywhere, anytime—means your GM Detroit Diesel-powered equipment starts *right now* as soon as you pull the starting lever, even at low temperatures or after your equipment has been idle for long periods.

With a Hydrostarter on your GM Detroit Diesel engine, you enjoy thousands of starts without parts replacement, maintenance or downtime expense because all components are self-lubricated and sealed against dirt.

You can order a Hydrostarter for your present engines or on your next GM Detroit Diesel. Your distributor has them available for you now—call him today or write direct for more information.

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MORE PULL WITH LESS FUEL!

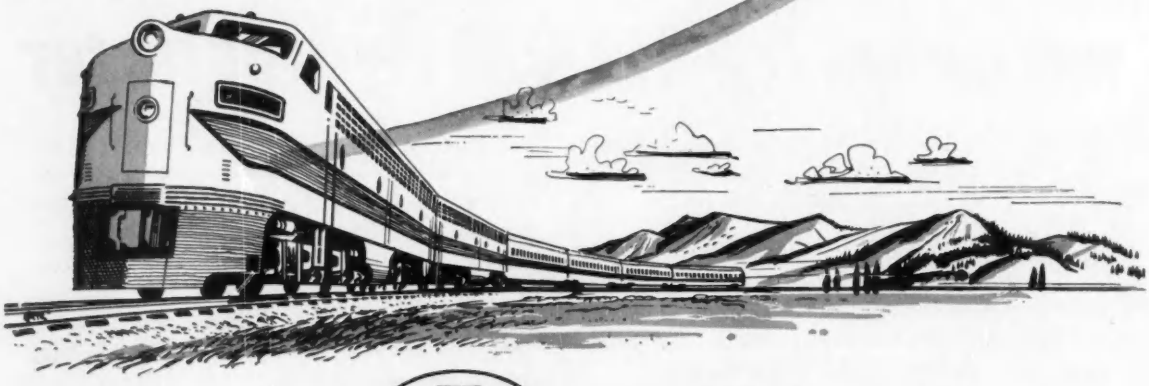
AiResearch Turbochargers provide rapid response to acceleration demands...end objectionable smoking!

Consider what the application of AiResearch Turbochargers to diesel locomotives will accomplish: A team of these small power packages will provide a greater increase in power at smaller cost in space and weight than any comparable turbocharger or supercharger installation.

In addition, specific fuel consumption on a horsepower per hour basis will be far less. Sea level performance will be restored within operating limits at altitude, response to acceleration demands will be rapid and excessive smoking under operating power eliminated. Also, the noise level will be greatly reduced.

Application in other fields will be equally effective, as has already been demonstrated in the remarkable results achieved by the installation of AiResearch Turbochargers on Caterpillar diesel machinery.

AiResearch is the largest producer of small turbomachinery in the United States, with twenty-five *million* hours of experience. This unmatched experience explains why AiResearch Turbochargers lead in power, economy and dependability.
Your inquiries are invited.



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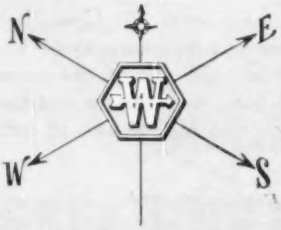

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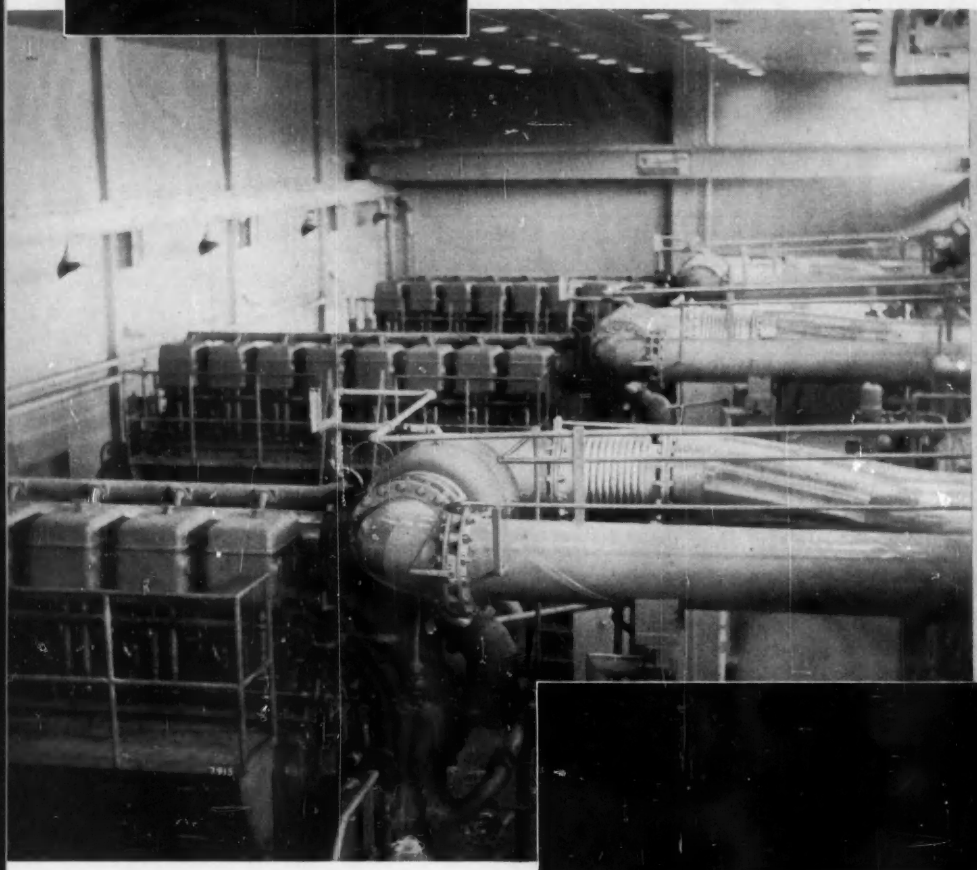
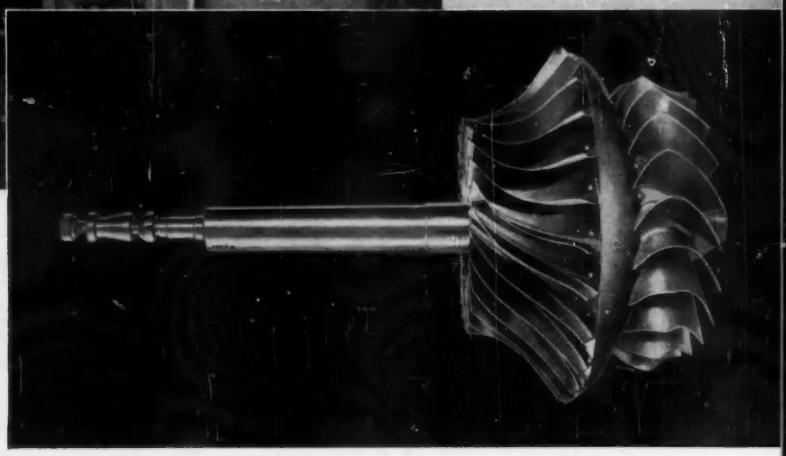
HIGH PRESSURE TURBOCHARGERS

efficiently serve diesels at Lakehead Pipe Line Company



Exclusive
MONOROTOR
Construction



Located in an outlying district in Northern Minnesota, this oil pumping station of the Lakehead Pipe Line Company must have *dependable, efficient* equipment. That's why Nordberg Diesel engines *with De Laval High Pressure Turbochargers* were chosen for this service.

The De Laval turbochargers efficiently utilize the exhaust gases to supply the high intake air requirements of these 1800 BHP, eight cylinder, four-cycle Supairthermal engines. Shown in the photograph are three units. Six other identical engines operate in pairs in three other stations of this company.

Due to the exclusive Monorotor design, De Laval High Pressure Turbochargers have a pressure ratio up to 3:1, as well as far higher pressure and turbine efficiencies than those found in conventional turbocharger systems. They are self-adjusting to engine loads, can be used with 4- *and* 2-cycle engines.

Write for De Laval Bulletin 8000 giving comprehensive curves and flow range diagrams.

DE LAVAL *Turbochargers*

DE LAVAL STEAM TURBINE COMPANY
890 *Nottingham Way, Trenton 2, New Jersey*

DL 384

Cutaway view of Deutz Air-Cooled V-type Diesel, showing finned design around combustion area. Heads and cylinders easily removed individually

DEUTZ

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With a vast record of successful routine performance in temperatures ranging from 140°F to −40°F, DEUTZ Air-Cooled Diesels are known the world around as the rugged power units that feature dependability, simplicity, and economy.

DEUTZ Air-Cooled Diesels are built with horsepower ratings from 5 to 250, and in 1, 2, 3, 4, 6, 8 and 12-cylinder models. Their air-cooling system provides easier, quicker starting and faster warm-up. They operate at higher temperatures which yield higher efficiency and freedom from corrosion problems related to sulphur content of most fuels.

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DEUTZ also builds special water-cooled Diesels from 3 to 2000 HP for automotive, marine and stationary use.

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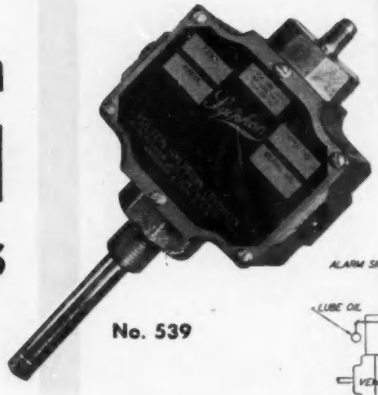
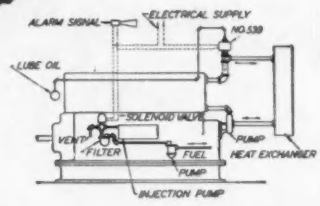
Why take chances on engine trouble?

No. 923-3

Depend on SYLPHON controls



No. 539



Typical installation of No. 539.

YOU NEVER NEED to cross your fingers—or trust to luck—with these Sylphon controls. When they're on the job, they safeguard you against engine trouble—day and night. They help ward off costly shutdowns, damage or repairs.

No. 539 control gives positive protection against high jacket water temperature or low lube oil pressure. If water jacket temperature goes above, or lube oil pressure goes below safe limits, it sounds an alarm—or shuts off the engine. Also available for temperature or pressure only.

No. 923-3 Regulator is equally dependable. It thermostatically controls cooling water circulation—keeps engine jacket temperature right. Can be manually operated—if and when desired!

Both controls are ideally suited to diesel, gas or other internal combustion engines. Self-contained and self-powered, they're built to give you long, trouble-free service. Easily installed. For complete information, send for Bulletin TD-817.

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Send me information on how I may obtain a Pure-sure Used Oil Analysis of my used diesel lubricating oil without cost or obligation.

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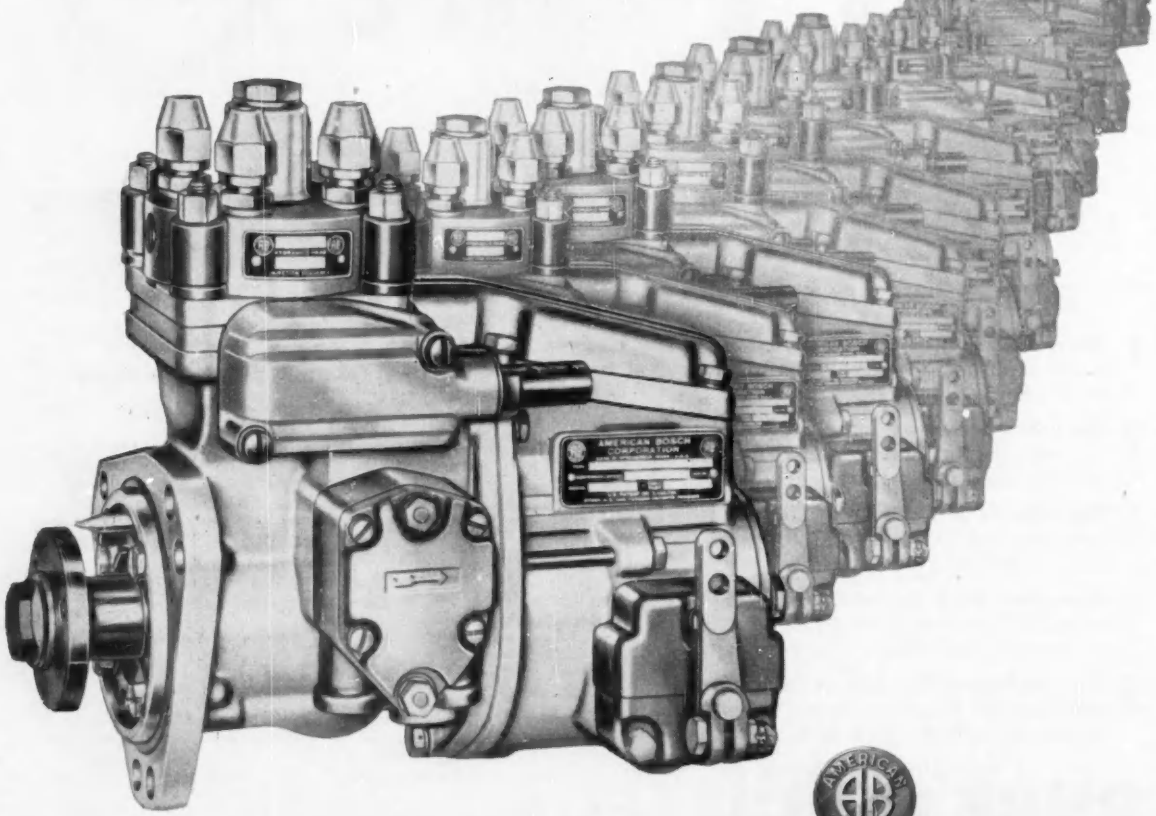
over 100,000...and STILL GROWING

Now over 100,000 American Bosch PSB injection pumps have been produced for the Diesel Industry.

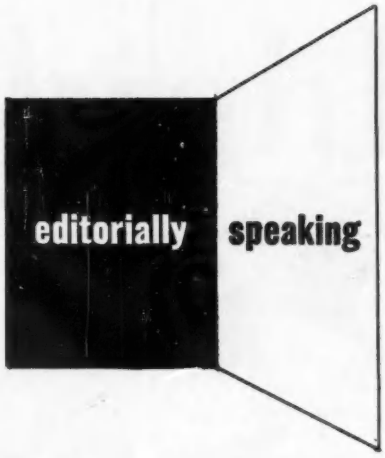
This record, established in the space of just a few years, proves conclusively the wide acceptance of this simplified, distributor type pump.

Today, more Diesel engine manufacturers than ever before are using the American Bosch PSB as standard equipment on the smaller Diesels that power farm tractors, compressors, generating sets, boats and trucks in ever-increasing numbers.

The American Bosch PSB has an outstanding record of performance and dependability—assuring users everywhere of long trouble-free service and low maintenance expense. It stands as a significent contribution to the progress of the Diesel engine. American Bosch, Springfield 7, Massachusetts.



AMERICAN BOSCH



A Fable of Today

Among sellers of power in the land were builders of the machine called diesel. More flexible than oxen yet strong like the elephant, the diesel was like unto the camel in that it went long between drinks, yet was unlike the horse in that it did not eat when idle. And it found great favor among the people. In the beginning, each builder could watch over users of his engines as the numbers were small. So advantageous were diesels that users reckoned not the cost of parts and service for these engines. Besides, they could not turn elsewhere. But times did change. More and ever more of these engines found use and builders no longer could keep track of them. Fuel for diesels did rise in cost moreso than that for other machines, the builders of which strove to outsell the diesel. And so it came to pass that the cost and speed of repair grew in import to the user. Some would do their own work; others wished local shops to render them service, the builder's shops being perhaps far away. And local shops, particularly wished a percentum of the cost that they might pocket. All sought special knowledge to maintain properly these engines. Some builders did see these portents and did shape their policy to best serve their customers. For when users prospered with their diesels, they bought more and each provided revenue in parts. These builders prospered mightily. Some went part way and prospered in proportion. Still others, being so engrossed in building new machines, did neglect the needs of the user and their engines fell into disrepute. Also, there were makers of parts who though they did not build engines were fitted to build certain pieces. Some, in their vernacular of the day, were "out to make a fast buck". Of greater import, others built quality products and were smart and aggressive. Both eyed the large and growing market for parts, grown in value of gold larger than that for new machines and a great prize to be sought with vigor. This being a very modern fable, the end is not yet. Some shall prevail and some shall fall by the wayside. Still, the moral is clear and as Aesop might have said, "The league gets bigger, boys. Sharpen up or you may wind up on the bench."

B P E

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- Combines the best characteristics of iron and steel.
- Equals or surpasses the wearing quality of cast iron.
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- Retains true shape even after much deflection.
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- Functions efficiently without chrome plating.
- Has high resilience.
- Now used for orginal equipment in heavy-duty engines.
- Now available for replacement use.

Cyclan is exclusively a Sealed Power development.

Write for "The Cyclan Story"

SEALED POWER CORPORATION
MUSKEGON, MICH.

Sealed Power
PISTON RINGS • PISTONS
• CYLINDER SLEEVES

highlights

- Looking ahead to full modernization, Chicago's Transit Authority is experimenting with Mack's diesel-electric rail buses. These were originally built to handle light branchline service on the New Haven.

- A new development in the metal field —microporous chromium-nickel stainless steel. Used as a gas filter, the material is said to catch particles ranging from 4 to 20 millionths of an inch.

- Radio-controlled tractors are being demonstrated in England, by Ford. Steering gear, clutch, implement lift, and emergency cutout all operate on signals sent out by remote control.

- Eight hundred forty-nine new diesel-electric units were on order by Class I rails as of Nov. 1, the largest since March 1953. In the same period last year, 148 were specified.

- ASA has just approved its 1500th American Standard. It's for nickel-chromium-iron alloy seamless pipe and tubing.

- Long-life valves for undersea oil operations are being researched by Rockwell Mfg. Co. Already achieved—long-distance microwave valve-operating equipment, so that an operator sitting comfortably ashore can turn oil on and off at undersea wells hundreds of miles away.

- Correspondence courses in power engineering are being set up by the University of Wisconsin under sponsorship of the NAPE.

- Klockner - Humboldt - Deutz, German air-cooled diesel builder, says that it has increased production by 65% above last year's—to 20,000 cylinder units monthly. For the past 5 yr, it has reached a combined production of 150,000 diesel engines, and is claiming world leadership in diesel engine manufacture.

- Resistance welding and design for welding will be top topics Feb. 1 and 2 at the midwest welding conference sponsored by Armour Research.

- Having trouble getting into those small parking spots? The English have developed a device enabling front or rear of a car to be moved sideways. It's made of two steel platforms mounted on swiveling ball-bearing casters.

- The jointly operated Pennsylvania-Reading Seashore Lines has ordered 12 Baldwin diesel-electrics.

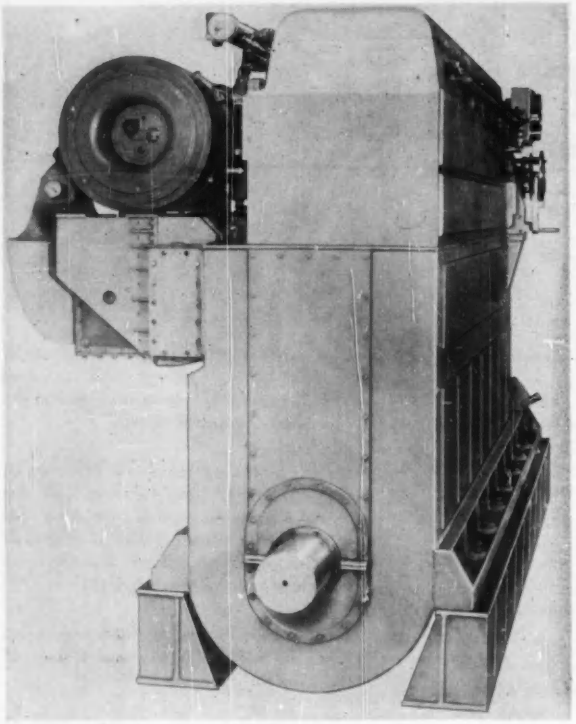
- Two of F-M's Model 38D8-⅛ diesels have been sold to city power plants in Mo. A 10-cyl, 1600-hp, 1140-kw unit has gone to Thayer, and an 8-cyl, 1280-hp, 960-kw is working at Kahoka.

- Bendix Aviation's new electronic computer has been installed by a Southwest oil company to speed up search for oil deposits. It's used to bypass the hundreds of manhours required for analysis of earth strata and reservoirs.

- The green light has been given to seagoing piggyback. ICC has ruled that MacLean Pan-Atlantic Steamship Corp. needs no special authorization to transport truck trailers by motorship.

- American rails retired 1000 more steamers this past year and purchased or leased 871 diesel locomotives. Total of diesel-electrics in Class I roads now stands at 24,348 as against 7047 steam units. These figures were cited by D. R. Meier, GE, at the ASME meet.

- Owing to the non-uniformity of railway gauges in the down-under country, Australian railways have been forced to adopt unique systems of freight travel. In south Australia, for example, when a standard gauge break occurs, the complete narrow gauge train which is usually made up of 14 cars of cattle and 4 of coal, is piggy-backed on to standard trucks.



Front of engine shows the turbocharger at upper left with intercooler below. The stub shaft is available for power take off.

A Self-Sustained Turbocharged 2-Cycle Diesel

Kahlenberg's 2-cycle diesel needs no auxiliary device to assist turbocharger when starting or running.

OPEN the air supply valve, move the single control to the start position and the engine starts to roll. In just a few turns combustion starts, the air starting valves automatically close, and you move the lever to the "Run" position. As the handle is advanced through the speed control range, you notice the smooth and rapid response to the throttle.

Sounds pretty simple and conventional—and it is. But that's what makes news because this is a completely self-sustained, turbocharged 2-cycle diesel engine that we are talking about—believed to be the first such diesel (there have been natural gas engines) to be developed and offered commercially in this country. It may even be the first in the world to achieve such operation in a 2-cycle engine of under 12-in bore. In any case, this is the first of the new "Model E" line of engines developed by the Kahlenberg Bros. Co. of Two Rivers, Wis. The Kahlenbergs like to pioneer; they pioneered as engine builders as far back as 1895 and now have successfully tackled a new frontier.

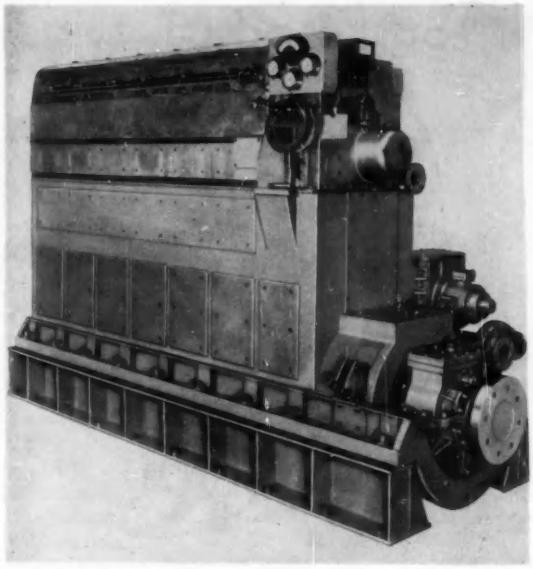
General Data

The Model E is a vertical, heavy-duty, direct injection, 2-cycle engine employing uniflow scavenging and pulse-system exhaust turbocharging. It starts and operates throughout its entire speed range *without a scavenge pump, blower, auxiliary drive or any other device* to assist the turbocharger. It idles smoothly at speeds as low as 100 rpm.

Since Kahlenberg has been intimately associated with the marine field for many years, the first model built was a marine version. It was designed for direct reversing and reverses rotation rapidly and smoothly in accordance with the positioning of the single control handle. This model can be used for direct drive and reduction gears can be adapted for extremely low propeller rpm. It is equally adaptable for multi-engine geared drives where higher horsepower in a single shaft is required.

However, this neat and compact design was also intended for general service in a variety of fields involving stationary service. Illustrations show the 6-cyl model that has been under continuous development for over six years. It has a bore of 10½-in and a 16-in stroke. As to compactness, the engine is about 12-ft long from the front of the engine to the flange and stands about 6½-ft above the crankshaft centerline.

Tests at 300 to 400 rpm and 100 bmep show a very flat fuel curve with excellent operating characteristics and good combustion. Average specific fuel consumption of 0.380 lb per bhp/hr is obtained while driving all auxiliaries including both the sea water and jacket water pumps of this marine version. Piston speed is low, being only 1066 fpm at 400 rpm. All the evidence seen indicates that the engine has considerable reserve power.



First model built is a direct reversable marine engine. It is simple, clean and compact—about 12-ft long and 6½-ft above the shaft center—with base-mounted flywheel and thrust bearing. Auxiliary drive for water and oil pumps is at right above flywheel.

Turbocharging System

Turbocharging is done by the pulse system using a unit built by D. Napier & Son, Ltd. of England. Napier engineers cooperated in matching the turbocharger to the engine. One of their standard line of turbochargers was used and adapted by selection of the diffuser and turbine assembly to get the best match.

Sectionalized, dry-type manifolds lead the exhaust gases to the 2-entry turbocharger. Each manifold is carefully streamlined and its volume controlled so as to provide the maximum possible pulse energy at the turbine nozzles. The manifolds are lagged to retain the exhaust's heat energy. Arrangement of the lagging is such that the manifolds can be removed without disturbing it.

Exhaust valves are timed to permit blow-through of the scavenging air between the exhaust manifold pressure peaks when this manifold's pressure is lower than that of the inlet manifold. This permits the scavenging air to clean out residual gases and cool the parts.

Scavenging air from the turbo's compressor goes through a large-area intercooler before entering the engine's air box. This reduces the charge temperature to lower the thermal loading in the cylinder and increases charge density to permit more fuel to be burned for higher output. The air box is sized to allow stabilization of air pressures to insure that each cylinder get air at the same pressure.

Component Details

Welded frame construction is used and results in a greatly reduced weight for such a low rpm, heavy-duty engine. The frame is of the "U"-type, one-piece design with through-bolt stress members. The crankshaft and its bearings are bedded in the base portion of the frame. The base runs the full length of the engine to the coupling and for marine service a separate adjustable-type thrust bearing is mounted inside the base between flywheel and coupling.

The crankshaft is machined from a solid steel forging and is drilled for lubrication. Main bearings consist of lined steel shells and backs rigidly supported in the base. Crankpin bearings are the 2-piece marine type consisting of removable and interchangeable lined bronze-backed shells.

Removable individual cast iron cylinder jackets are used with wet-type removable liners of a special analysis iron. Liners are machined overall for uniform section, accuracy of porting and proper fit. Water jacket connections are made with flanged jumpers.

Pistons, which are oil cooled, are of special iron, thoroughly annealed and ground. Piston pins are clamped in the eye of the connecting rods and oscillate in two bronze piston pin bushings. Connecting rods are of the footed type and are machined all over. Both connecting rods and piston pins are specially drilled for full-flow oil cooling of the piston.

The camshaft is a single piece with the cam cluster keyed in place. In the direct-reversing version, the cams are ramped to permit the followers to slide to the opposite rotation cam as the camshaft is pneumatically shifted endwise. Multiple roller chain drives the camshaft and also the scavenging and pressure lube oil pumps, fuel transfer pump and the centrifugal jacket and sea water pumps.

Each individual cylinder head has two exhaust valves in water-cooled cages, a fuel injection nozzle and a caged poppet-type air starting valve. There is a separate rocker arm for each valve and the entire valve gear is pressure lubricated. A special valve shield is provided, making it impossible for an exhaust valve to drop into the cylinder under any circumstances.

Fuel pumps are the individual type too and are mounted in a gallery immediately above the cambox and adjacent to the cylinder heads. Extremely short and equal length injection tubes are used. C.A.V. pumps with the familiar port-and-helix type of metering are used on this engine although American Bosch and Bendix equipment can also be applied.

Pump racks are all linked to a common governor control rod. Application will control whether a mechanical or hydraulic governor is used.

As mentioned, the Model E has a full pressure lubrication system even to small remote parts. Built-in rotary pumps act as pressure and scavenging lube oil pumps. The latter is needed as this is a dry-sump engine. A shell-and-tube, type cooler of large capacity controls oil temperature.

Jacket water cooling arrangements are flexible since

the pump or pumps can be engine-driven or motor-driven pumps substituted. For marine use, a closed fresh water circuit removes engine heat and then this primary system can be cooled in a number of ways.

Maintenance Features

Simplicity of maintenance received attention early in the design phases. First, Kahlenberg kept the overall design as simple as possible. Then, conservatism in rating was intended to space out the incidence of necessary maintenance.

Accessibility got a lot of thought. For example, you can get at the main and crankpin bearings through the generous crankcase doors. You can get at the cylinder heads and the valve gear by lifting the appropriate valve cover. Another thing, all of these access doors and covers are aluminum and have very simple flush-type fastenings.

All covers are sectionalized so that they are small and light enough to handle conveniently. The absence of long rows of bolts to be unfastened is not only a time saver but is conducive to more frequent inspection.

The unit replacement concept was also used. In this case the objective was to permit removal and replacement of assemblies with minimum disturbance of other parts. Typical is the arrangement for piston removal. Clearances are such that once the footed connecting rod is unbolted from the bearing box and the crank rotated away from the access door, the rod drops down into the base sufficiently for the piston to clear the liner and slide out. In this way the heads, valve gear, manifolding, etc., need not be disturbed.

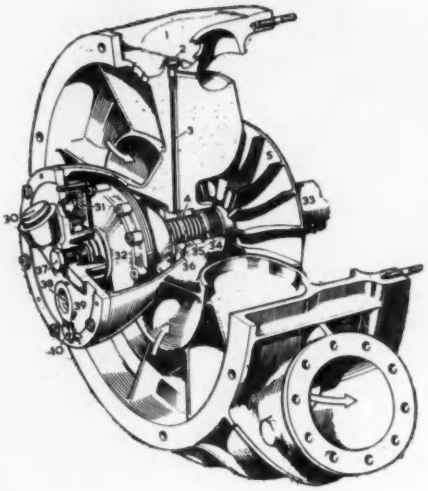
Following up this idea, the camshaft is removable as a unit without disturbance of the camshaft drive. The converse is equally true. Valve cages and the caged air valves can be removed individually for reconditioning without removal of the cylinder head.

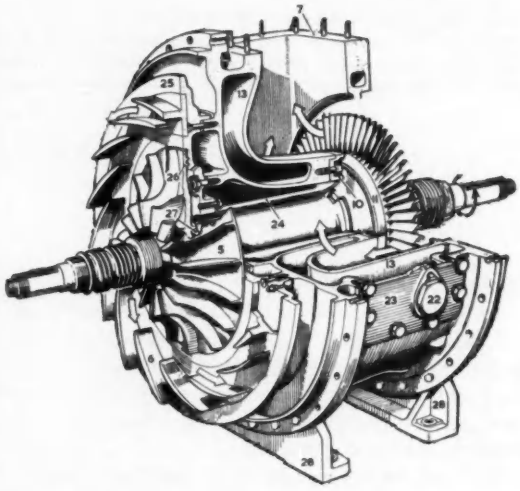
Conclusion

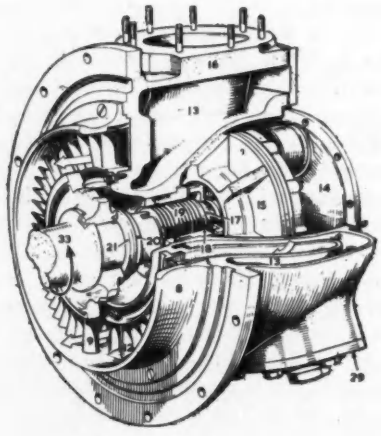
Kahlenberg has produced quite an engine. During the observed dynamometer testing it started readily. Response to speed and load changes was very smooth and fast. When the engine was set well below the 100 rpm idling mark with no load there was no evidence of running out of air despite the low level of exhaust energy. It accelerated immediately when the throttle was advanced.

No appreciable vibration was noted at any speed or load. The engine itself was quiet and characteristic of turbocharged engines, the exhaust noise level was low. No silencer was used during testing although the plant is close to a residential area.

These Model E engines are now being offered in 4-, 5-, 6-, 7- and 8-cyl units with deliveries beginning in the spring of 1956. Typical of Kahlenberg's conservatism, horsepower ratings are presently based on a bmep of 95 psi. This gives a power output range from 100 to 133 bhp per cyl at speeds from 300 to 400 rpm with plenty of overload capacity in reserve.







Napier Turbocharges New Kahlenberg Engine

In previous pages we have discussed Kahlenberg's new turbocharged 2-cycle engine. Now, let's take a closer look at the turbocharger.

KEY TO CUT-AWAY VIEWS OF PRINCIPAL CASINGS

1. Compressor outlet casing
2. Air restrictor plug
3. Air restrictor passage
4. Oil seal bush
5. Impeller
6. Diffuser
7. Turbine outlet casing
8. Shroud ring
9. Turbine blades
10. Sealing ring
11. Turbine wheel (complete with blades)
12. Nozzle ring assembly
13. Coolant passages
14. End cover
15. Oil pump assembly, turbine end
16. Turbine inlet casing
17. Oil restrictor ring, turbine end
18. Oil seal bush, turbine end
19. Oil seal, turbine end
20. Turbine wheel retaining ring nut
21. Rotor balancing washer
22. Coolant connection (blanking plug fitted)
23. Inspection plate
24. Shaft cooling shroud
25. Seal plate
26. Impeller labyrinth seal
27. Turbine adjusting and rotor balancing washer
28. Mounting bracket
29. Inspection plate
30. Oil filler cap
31. Breather
32. Oil pump cover
33. Rotor shaft
34. Impeller adjustment washer
35. Oil seal
36. Oil restrictor ring
37. Tachometer access plug
38. Oil level sight glass
39. End cover
40. Oil sump drain plug

BY studying the drawings and key to the left, you will get a better picture of the Napier turbocharger. Regardless of size or model, this construction is representative of Napier design and construction. The model used with the Kahlenberg engine is an MS 200-5. It is only one of 14 models which comprise three series of turbochargers. The MS Series has a nominal operating pressure ratio of 1.5:1, is available in seven sizes, and is the medium pressure range.

In addition, there is the TS Series, with a nominal operating pressure ratio of 1.35:1, comprised of four models of varying size, and the HP or high pressure series having a 2.0:1 ratio, available in three sizes. Taking the entire line into consideration, this means that Napier turbochargers can be applied singly to 4- and 2-cycle engines with outputs from about 140 to 5000 bhp. With two or more units, turbocharging may be extended to large marine-type engines with outputs of up to 15,000 bhp.

Functional flexibility is gained in several ways. By varying the diffusers and turbine assemblies the turbine can be matched to the characteristics of a specific engine. For physical flexibility there are twelve mounting positions for each of the four casings. Depending on the number of engine cylinders and the arrangement preferred, 2-, 3-, and 4-entry casings are available for the turbine side.

As for features, D. Napier & Son, Ltd., lists several. First of these is the "fir tree" type turbine blade root, designed to permit some small lateral blade movement or "shake", as in current aircraft turbine practice. Anti friction bearings are used to carry the rotor assembly in all but two models of Napier turbochargers. Resilient bearing mountings, which permit slight radial movement of the rotor assembly in the casings, are designed to reduce the wear and brinelling of rotor assembly ball races and lengthen the time between overhauls.

Self-contained oil pumps are another feature. These have been designed with no touching parts to reduce frictional losses and wear. Dissimilar metals have been used in seals and brushes to avoid "pick-up" should frictional contact accidentally occur. Seals are easily removed and replaced and are strong enough to support the rotor assembly in the casings when the bearings are removed during servicing.

Heat transfer to the compressor side is prevented by circulating cooling water through both the turbine inlet and outlet casings, sacrificial zinc rods are fastened to the inside surfaces of the water jacket inspection plates to prevent galvanic corrosion.

In the two largest sizes of the MS Series, there is some difference in design, from other units. The greatest difference being that friction-type bearings are used to carry the rotor assembly. These are pressure-lubricated at about 45 psi by an independent auxiliary pump deliver-in to connections on the end covers rather than by the built-in pumps at either end of the other units.

CBE (cab-beside-engine) design permits short, lightweight tractors, easy accessability to engine and good driver visibility.

Why Did Yellow Transit Go Diesel?

What were the factors that led Yellow Transit to buy 210 diesel powered tractors—one of the largest single equipment orders—replacing their entire gasoline powered fleet? How did they approach the problem? What did they gain? Here is the story behind the story.

YELLOW Transit Freight Lines has gone 100% diesel. The replacement of their entire over-the-road fleet with 210 new Kenworth diesel tractors and 400 Fruehauf "High-Cube" Volume Van trailers is one of the trucking industry's biggest equipment orders.

The 210 new tractors are all of the CBE (cab-beside-engine) design, powered by Cummins JT-600 turbo-charged deisel engines. They were custom engineered and manufactured for Yellow Transit by the Kenworth Motor Truck Corporation of Seattle, Wash.

Included in the 400 high-cube aluminum trailers are 310 dry-freight vans (10 with curb-side doors); 20 insulated vans; 40 heavily-insulated Thermo King refrigerated vans; and 30 open-top trailers.

This is a lot of equipment and the complete changeover from a gasoline-powered fleet to a 100% dieselized over-the-road operation is a big step for any truck line to take. While the size of the order and the fact that they went diesel are each stories in themselves, there is a third story —Why the switch to diesels?

Let's take a look at Yellow Transit and its operation so as to fill in the . . . .

Background

Yellow Transit Freight Lines, a common carrier of general freight, operates a network of 8435 miles of certificated routes between the Great Lakes and the Gulf of Mexico. States served are: Michigan, Indiana, Kentucky, Illinois, Missouri, Kansas, Oklahoma and Texas. There are major terminals located in all of these states.

The company's general offices are located in Kansas City, Missouri. It is here that the Central Dispatch Office, in touch with all Yellow Transit terminals by direct-line telephone, controls and dispatches the tractors.

Yellow Transit uses a "relay" type operation. Tractors are relayed to their destination by changing drivers approximately every 300 miles. This allows tractors to average about 2000 miles per week.

The setup for maintenance has always been good. Preventive and major maintenance is handled and controlled by Yellow Transit's general overhaul base at Baxter Springs, Kansas. However, other shops are located at their terminals in St. Louis, Chicago, Indianapolis, Louisville, Kansas City, Oklahoma City and Dallas. In addition to maintaining the local pickup and delivery fleets, these shops are equipped and staffed to perform emergency repairs to road equipment.

Preventive maintenance is the basis of Yellow Transit's program. Varying PM checks are performed every 3000 miles. A complete cycle of PM checks is based on 3000,

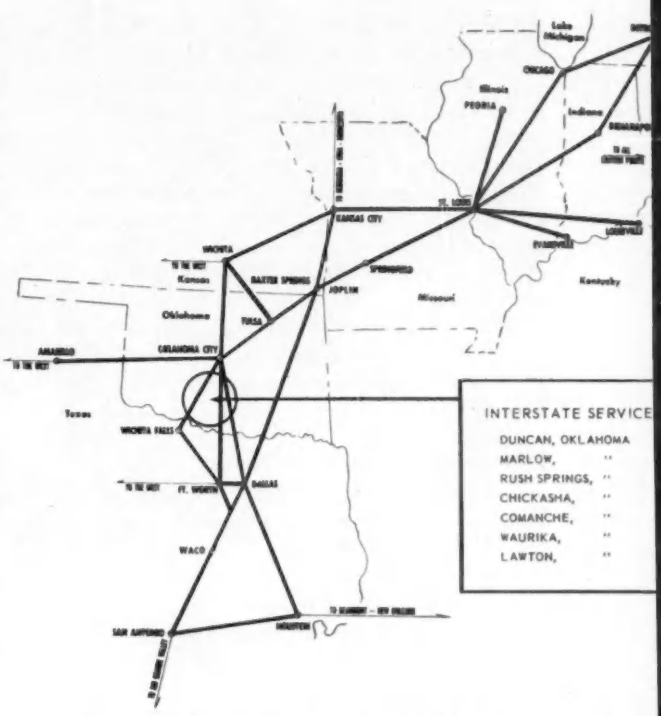
6000, 12,000, 24,000 and 48,000-mile intervals, each being progressively more detailed, and cover the complete tractor unit.

The PM checks due are monitored by the use of a "running graph" blackboard. If a tractor is becoming due for PM work the Central Dispatch Office immediately dispatches the unit to Baxter Springs and under no circumstances can it be moved from the base until it has cleared the shop. Chassis dynamometer and fuel flow ratings are used extensively in this work.

William R. Riley, superintendent of maintenance, points out another important phase of the maintenance program —use of detailed laboratory analysis of lube oils, fuel and water, as well as on-the-job "spot" checks. "Yellow Transit's long range program includes more and more emphasis on laboratory work," says Riley.

Within the framework of this setup, Yellow Transit handled more than 530-million pounds of freight through its terminals in 1954. It has approximately 850 employees and the company payroll amounted to more than 4½-million dollars last year.

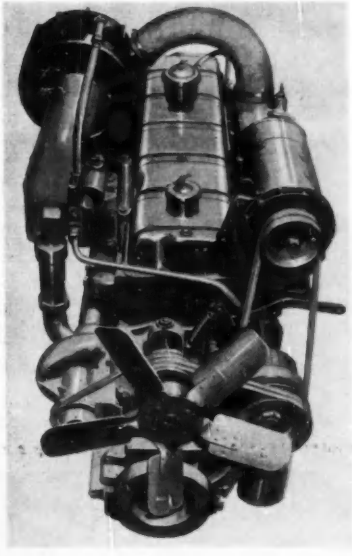
This brief rundown on the company still gives no reason for the switch to diesels; it could run this way with gasoline rigs too. So we must look further to see what was Yellow Transit's . . . .



System map shows area served and all Yellow Transit's major terminals.

Approach to the Problem

When the gasoline tractors were nearing the five-year old mark, the time to replace them with new equipment was approaching. Work started on the replacement program. Since they got what they went after, the objectives are well stated in the comments made by George E. Powell, Sr., Yellow Transit's president, after the equipment was ordered. He said, "This complete replacement of our highway equipment with a standardized fleet of the most modern and efficient units available for our type of operation will effect numerous maintenance and operating economies. It also means increased payloads, faster schedules, and improved service for our customers. The equipment program is an important part of our system-wide drive to provide the finest freight service available in the territory we serve."



The truck's high horsepower to weight ratio was made possible partly by the Cummins JT-6 "Turbodiesel".

Before even looking at any new equipment that might achieve these objectives, George E. Powell, Jr., vice president of operations and the superintendent of maintenance, Mr. Riley, listed all the features of a tractor that they thought would be most desirable for this particular operation.

First and foremost, they decided that as a minimum requirement the new tractors had to be at least as economical to operate as those on hand. Beyond this point, every possible effort should be made to effect savings.

Among the many factors considered was weight. They needed a lightweight tractor that would pull the new high-cube trailers. Another factor was ease of maintenance and particularly accessibility to the engine compartment. (At this point the CBE design began to look attractive.) In addition, it was felt that good visibility and driver's comfort were extremely important. Availability of parts and service was considered. In short, everything affecting maintenance cost, including labor, was considered along with the operating needs.

With their requirements set down, Powell and Riley began talking to other fleet operators and studying their experience with various types of equipment. In the course of their study it began to appear that a switch from gaso-

line-powered equipment to diesel power would give them the best answers to the question, "What type of power equipment is best suited to our operation"?

The advantages of the diesel plus the short overall length, excellent visibility and ease of access to engine for maintenance, which were characteristic of the CBE (cab-beside-engine) design, centered their study on Kenworth.

The next step was a thorough analysis of Yellow Transit's operating requirements by the Kenworth engineering staff. After their analysis it was apparent that their custom-engineered tractor would ideally suit Yellow Transit's requirements.

So now Yellow Transit had narrowed down their approach to one piece of equipment that could meet all the physical criteria. A further consideration was operating costs of which . . . .

Maintenance Costs are a Factor

Since maintenance costs bear such an important relationship to overall financial success of a trucking operation, it was a matter for careful consideration. Yellow Transit had experience and cost figures on gasoline engine operation but diesels were another matter. Figures from other operations showed the diesels in a favorable light but there was the problem of translation into terms of this particular operation and also that of the transitional period, during the switch-over of power.

However, the problem became largely academic thanks to Cummins' "Guaranteed Maintenance Program." Under this new plan offered by Cummins the engines are not only covered by the usual warranty but by a four-year guarantee covering the maximum cost of repair parts. During this period the user buys only the parts that he needs. If at the end of the four-year period the cost is higher than the guaranteed amount, he pays only the stipulated amount. If less—all to the good.

This program took most of the gamble out of going into diesel operation and was pretty much of a clincher in Yellow Transit's decision to select the Kenworth-Cummins combination. Now let's see some . . . .

Equipment Details

Starting with the new lightweight, functional, high-visibility cab-beside-engine design, Kenworth engineered a specialized truck with a high horsepower to low weight ratio suitable to the Mid-West terrain and length requirements encountered on Yellow Transit's system. At the same time, the performance, stability, ruggedness and long life normally associated with West Coast type vehicles were retained.

Custom-engineered to a tractor chassis weight of 8998 lb per unit, the 138-in wheelbase CBE tractor combines with a 35-ft high cube trailer for an overall length of 45-ft and a gross combination weight rating 60,000 lb. Cab-to-axle measurement on the tractor is 95 inches. The units have chrome manganese heat-treated steel channel frames. The two-axle, single axle drive trucks have two speed, hypoid double-reduction rear axle (5.62 to 1 and 7.21 to 1 ratios) and a front axle of 11,000 lb capacity. The Fuller 5A-65 heavy-duty five-speed transmission is used. Other features include four-wheel air-operated brakes, 65-gal fuel tanks and tubeless tires.

The trucks high horsepower to weight ratio was made possible by the use of the Cummins JT-6 "Turbodiesel." Rated 175 hp at 2500 rpm, this engine has a weight of only 9.2 lb per hp. Its torque curve is relatively flat with a peak of about 410 ft-lb between 1700 and 1800 rpm where it is of optimum value for acceleration. Speaking well for future economy, its fuel consumption rate at maximum power is 0.423 lb per bhp hr, with optimum rate of just above 0.39 at about 1800 rpm.

The importance of turbocharging is seen in the fact that the non-turbocharged version of this engine develops 50 less horsepower and has a lb per hp weight of 11.2. In comparison with a mechanically-supercharged version, the JT-6 develops 10 more horsepower and somewhat better fuel consumption. With well over 15 million miles behind these engines before they were placed in commercial service, there seems little doubt but that they will do the job and that Cummins has a safe bet in their Guaranteed Maintenance Program.

However, you can say what you want but the proof is found in some of the . . . .

Results to Date

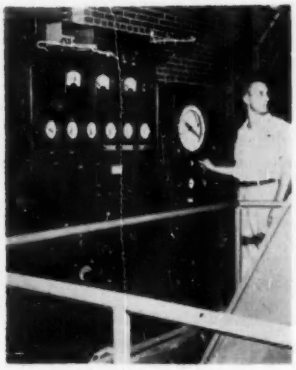
Orderly replacement of 250 gasoline powered tractors with 210 diesels has been no small task. At the time of writing about 180 of the new units were in operation. Of course the operating period has been so short that no detailed results are available; that will have to wait a later story. But already some results are apparent.

First, the new jobs handle 41,000-lb payloads with ease. It is bigger equipment than the former rigs that were taxed to their top output with 25,000 lb. Despite the bigger loads, the new fleet is turning in mileages of up to 7 mpg. This compares with an average of 4.4 mpg for the gasoline rigs. Bigger loads per unit permit other economies too—more tons per man-hour, for example.

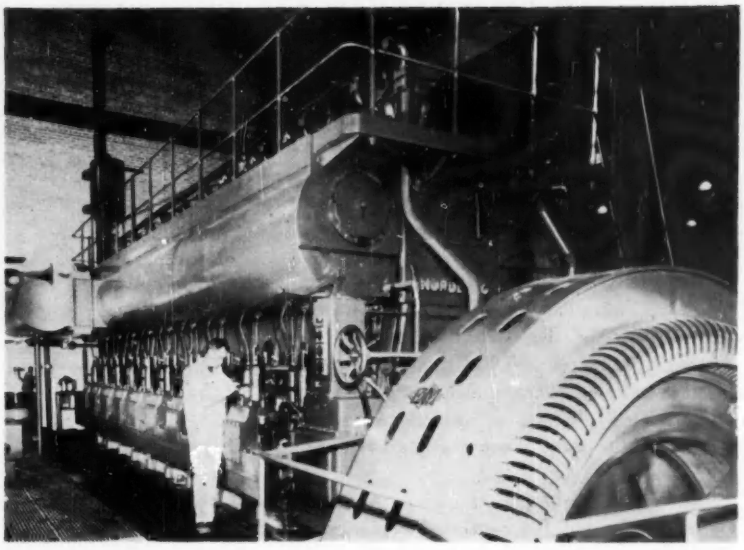
On top of this it begins to look as if the schedules can be tightened up and point-to-point times revised. The lugging ability of the diesel rigs and particularly the ability of turbocharged engines to maintain horsepower at the altitudes encountered adds up to higher average road speeds.

And speaking of mountains, the drivers taking the new rigs through the Ozark section, the only really rugged terrain in the whole system, humorously reported that the roads had been suddenly leveled out—over night! Drivers and also the people along the routes also appreciate the low exhaust noise level that is characteristic of the turbocharged engines.

Time will prove that Yellow Transit has chosen wisely in going diesel. They report that to date it is resulting in greater efficiency of operation, faster schedules and even better service for Yellow Transit's growing list of shipper-customers.



Gauge board located a few feet from 4800-hp engine assures maximum visibility at all times.



Latest plant addition, a 10-cyl dual fuel Nordberg, is shown with 3500-kw EM generator, American Bosch injection pumps, Manzel lubricators and Woodward governors.

Garland's Dual-Fuel Engines Are Profitable

Net profits are increased more than 123% over and above normal contributions to Garland, Texas, general fund. A cut in fuel costs of over 67% resulted from efficient operation of four dual-fuel engines.

KILOWATT capacity trippled, fuel costs reduced to 2.22 mills per kwh, and net profits jumped 123%, all in less than two years. That's the boast of the Garland, Texas, municipal power plant.

Garland, located about 14 miles northeast of Dallas, has become the center of intense postwar industrial and residential development. Since 1940, its incorporated land area has been expanded from one square mile to 10.7 square miles. Its population has jumped from, 2223 to 24,500; and its consumption of power has increased more than 30-fold, from 1,375,000 kwh in 1940 to 41,500,000 last year. Of this 1954 total, approximately 13,000,000 kwh were purchased.

Load Demand and Production Figures

The load at Garland's municipal power plant has risen with a big assist from home, office and industrial air conditioning. In 1950, the plant's total peak load, including purchased power was 4380 kw. In 1954, the peak reached 9702 kw, an increase of more than 1000 kw per year or 121%. Before the end of 1955, peaks are expected to top 10,000 kw.

To help meet this increased demand, the power plant has constructed two additions to its original building and has installed four Nordberg Duafuel engines since 1949. The first two engines installed, a pair of 6-cyl, 16-in x 22-in, supercharged, 4-cycle engines, rated 1220 hp at 327 rpm, went into operation in January 1949.

Housed in the first of the two new building additions, they more than doubled plant capacity, increasing it from 1166 kw to 2876 kw. Peak loads continued to increase at a rate of 1000 kw or more per year, however, and in January, 1953, and October, 1954, two 2-cycle, 21½-in x 31-in Nordberg Duafuel engines were installed, more than tripling plant capacity, from 2876 kw to 8686 kw. The first of the two units is a 7-cyl engine, rated 3010 hp at 225 rpm and driving a 2860-kva, 2310-kw generator. The newest is a 10-cyl unit, rated 4800 hp at 240 rpm and driving a 4375-kva, 3500-kw generator. Almost immediately, these two engines became the plant's base load units.

In 1947, prior to the installation of the Nordberg engines, three original diesels generated a total of 1,023,800 kwh, while consuming 81,807 gal. of fuel oil at an average rate of 12.51 kwh per gal. At today's delivered price of 8.66 cents per gal for fuel oil, this represents an average fuel cost for the 12-month period of 6.92 mills per kwh.

Since the installation of the four new engines, which regularly carry more than 95% of the plant's total load, these fuel costs have been cut more than 67%. During the 12-month period ending on April 30, 1955, the Gar-

land plant generated 30,282,930 kwh. Of these all but 44,410 kwh, were generated by the five dual fuel engines, including one of the original diesel engines which was converted to dual fuel in 1952.

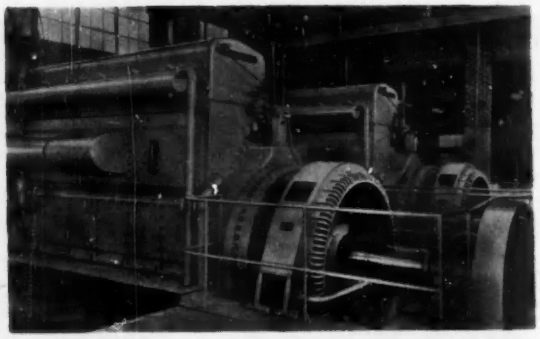
In this same period, a total of 284,093 mcf of natural gas was consumed at a cost of $46,869.94. Also a total of 225,947 gal of pilot oil and 4533 gal of fuel oil was consumed at a combined cost of $20,032.74. This represents an average fuel cost for the entire plant of 2.22 mills per kwh.

In terms of thermal efficiency, the improvement in operation introduced by the four new engines is also impressive. The diesel oil used at the Garland plant averages 7 lb. per gal. and 19,360 Btu per lb. The natural gas used averages 915 Btu per cu ft. In 1947, by consuming 81,807 gal of fuel oil and producing 1,023,-800 kwh, the three older engines averaged 10,828 Btu per kwh.

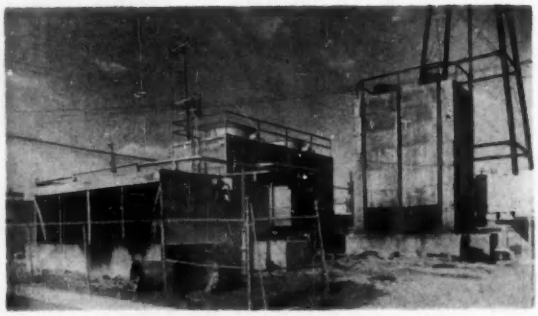
In the 12-month period ending April 30, 1955, the four engines and the converted engine averaged a low 9609 Btu per kwh, an improvement of 11%. This is based on a consumption of 284,093 mcf of natural gas at a rate of 9.38 cu ft per kwh and 225,947 gal of pilot oil at a rate of .0074 gal per kwh. Dual fuel production for this period was 30,238,520 kwh.

Net profits, also took a sharp rise. In 1951-1952 the plant generated a total of 13,751,748 kwh, and purchased an additional 11,507,751 kwh. The total cost of operating the electric department, including $100,517.61 for purchased power and including all administration expenses, contributions to the city's general fund, distribution, and all power plant costs except depreciation, was $270,737.-26. Gross revenue that year was $402,395.49 and net profits, after depreciation, were $96,973.36.

From 1953-1954, the plant generated a total of 26,-348,960 kwh and purchased 14,626,947 kwh. The cost of purchased power averaged 9.51 mills per kwh, compared to 8.73 mills in 1951-1952. Despite this increase, net profits jumped 123% over the previous period. The total cost of operating the electric department, including $139,126.33 for purchased power, and including all expenses listed above, was $398,116.14. With gross revenue at $668,935.99, net profit after depreciation were at an all-time high of $216,633.67.



Two 1220-hp, supercharged dual fuel engines are shown with 855-kw Elliot generators, 15-kw G-E exciters and Marquette governors.



Marley raw water and intercooling water towers and water cooled air intake filter are set in rear of plant as is a Briggs tower.

Plant History

The Garland plant dates back to April 1, 1922, when a 75-hp diesel was installed to provide standby power for the city's water supply pumps. Ten months later a 100-hp diesel was installed to supply power for street lighting and for any citizens who wanted to purchase it. In March, 1924, the small 75-hp diesel was replaced by two larger units, one rated at 100 hp and the other at 150 hp.

By 1930, a fourth engine, rated at 240 hp and driving a 200-kva generator was installed. No additional power was needed until 1939, when the first defense plants began to arrive at Garland. A 575-hp diesel was put on the line that year, followed in 1941 by an 875-hp unit. At the outbreak of World War II, the Garland power plant had three diesel engines on the line, the old 100-hp and 150-hp units having been retired. Since the three engines in service totaled only 1166 kw in capacity, it became necessary to purchase large amounts of power to meet the wartime demand.

With the end of the war, however, the availability of new diesel equipment, plus the availability of natural gas once again turned the city's attention towards expansion. In 1949, the first two Nordberg Duafuel engines were installed. These were 6-cyl, 16-in x 22-in, supercharged-units direct-connected to 1069-kva, 855-kw, 4160/2400-v, 3-phase, 60-cycle generators, with vee-belted 15-kw exciters.

In August, 1952, the 875-hp engine was converted to dual fuel and on January 1, 1953, the city installed its third Nordberg engine, a 7-cyl, 3010-hp Duafuel unit driving a 2890-kva, 2310-kw, 4160-v, 3-phase, 60-cycle generator with vee-belted 30-kw exciter. Total peak that year, including the demand placed on a nearby utility was 7955 kw. In the next 12 months this peak jumped almost 1800 kw to 9702 kw.

In October, 1954, the Garland plant added its fourth Nordberg Duafuel engine within five years, bringing plant capacity up to 8686 kw. This, the largest of the seven engines now in service, is a 10-cyl, 4800-hp unit

driving a 4375-kva, 3500-kw, 4160-v, 3-phase, 60-cycle generator, vee-belted to a 40-kw exciter.

Plant Accessories

Pilot oil for the four Nordberg Duafuel engines is stored in two underground tanks, one 15,000-gal concrete and one 12,000-gal steel. A new 12,000-gal steel tank is being constructed above ground to replace the steel tank now underground. The oil used is blended by a local distributor and is of 32-36 gravity.

From storage the fuel is picked up by two 2-in motor driven transfer pumps and sent through individual strainers and meters to the day tanks serving the engines. For the two 1220-hp engines, these tanks are located in the basement and fuel is sent to the cylinders through duplex filters by engine-driven supply pumps. For the 3010-hp and 4800-hp engines, the day tanks are wall mounted and fuel flows by gravity to the individual engine-driven supply pumps.

Natural gas at 65 psig passes first through an orifice-type meter. Then it flows to individual cleaners for the 3010-hp and 4800-hp units and to a common cleaner serving the two 1220-hp engines and the 875-hp engine. After cleaning, the gas passes through an individual regulator for each engine and through separate meters for the two largest engines. The 1220-hp and the 875-hp engine are served only by the orifice-type meter. The gas reaches each dual-fuel engine at approximately 25 psig.

Scavenging air for the 2-cycle, 4800-hp engine is supplied at 3.31 psig by a 23,000-cfm centrifugal blower, driven at 3550 rpm by a 450-hp induction motor. Since this blower draws power from the engine's 3500-kw generator, batteries are used to force the generator's field when starting the engine.

The 3010-hp Nordberg is also a 2-cycle engine and scavenging air is supplied at 2.65 psig by a 15,120-cfm centrifugal blower, driven at 3550 rpm by a 250-hp line-start induction motor. This blower also draws power from the unit's generator but instead of batteries, a 5-hp, 1735-rpm, motor-generator set is used to force the generator's field during starting operations.

Supercharged engine air for the two 4-cycle, 1220-hp engines is supplied to the cylinders by built-in, exhaust gas-driven turbines, located at the control end of each engine.

Scavenging air for the 4800-hp and 3010-hp engines is regulated according to load conditions through an automatic control system which is actuated by the temperature of the exhaust.

Standing-type gauge boards are erected near the control stations of the 3010-hp and 4800-hp engines, assuring visibility. Compact gauge panels for the 1220-hp engines are mounted directly on the engine frames, also adjacent to the control stations. All gauge boards are equipped with duplex and simplex pressure gauges, exhaust pyrometers, and visual and audible alarms on jacket water and lube oil pressures and temperatures. The boards serving the larger engines also contain push button controls for all motor-driven auxiliaries as well as ammeters, kilowatt meters and voltmeters. Adjoining each of these boards is a separate panel containing a 24-hour recording meter on exhaust temperature.

Starting air for the four engines is supplied at 250 lb by a two-stage, vee-type compressor, driven through a vee-belt by a 10-hp motor.

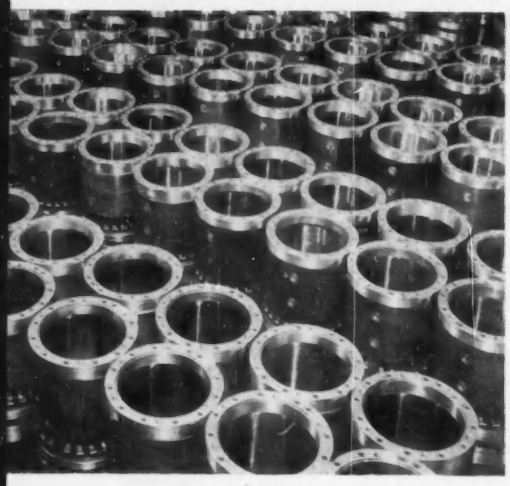
All power at the plant, including incoming purchased power, is controlled at a 10-panel switchboard. This board is equipped with oil circuit breakers, watt-hour meters, voltage regulators, ammeters, volt meters, continuous graph-type megawatt recorders, a kilowatt X 100 meter on incoming power, and a swinging synchroscope.

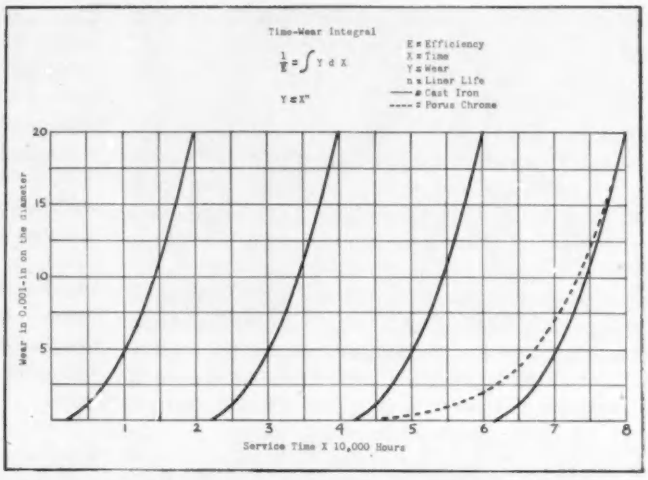
Conclusion

With this equipment, all installed in the two building additions completed since 1949, the Garland municipal power plant has taken a long step towards self sufficiency. Sharply reduced operating costs have helped the electric department maintain a low rate structure, thereby promoting industrial and civic development.

Principal Equipment—Four New Engines

Engines	Nordberg Mfg. Co.
Generator	Elliott Co.
	Electric Machinery Mfg. Co.
Governor	Woodward Governor Co.
	Marquette Metal Products Co.
Fuel System	
Filters	Wm. W. Nugent & Co., Inc.
	Hilliard Corp.
Meters	Buffalo Niagara
Injection pumps	American Bosch Arma Corp.
Lube Oil System	
Coolers	Kewanee-Ross Corp.
Filters	Hilliard Corp.
	Nordberg Mfg. Co.
Pumps	De Laval Steam Turbine Co.
	Allis-Chalmers Mfg. Co.
Mechanical lubricators	Manzel Div., Houdaille-Hershey Corp.
Cooling System	
Pumps	De Laval Steam Turbine Co.
	Allis-Chalmers Mfg. Co.
	Peerless Pump Co.
Heat exchangers	Kewanee-Ross Corp.
Temperature regulators	Fulton-Sylphon Div.
Cooling towers	Marley Co.
Gas System	
Scrubbers	Blaw-Knox Co.
Meters	Roots-Connersville Blower Corp.
Regulators	Pittsburgh Equitable Meter Div.
	Rockwell Mfg. Co.
Air intake filters	American Air Filter Co.
	Marley Co.
Air compressor	Gardner-Denver Co.
Gauge boards	Nordberg Mfg. Co.
Motor controls	Allen-Bradley Co.
Exhaust pyrometers	Illinois Testing Laboratories
Exhaust silencers	Maxim Silencer Co.
	Burgess-Manning Co.
Switchboards	Westinghouse Electric Corp.
Motor generator	Fairbanks, Morse & Co.
Turbochargers	Elliott Co.





Time-wear integral of a particular liner wear curve reflects not only cylinder wear but also engine efficiency, frequency and length of downtime etc.

Figuring Chromed Liner Costs

By J. M. A. van der Horst, General Manager
Van Der Horst Corp. of America

In any economic comparison of chrome plated cylinder liners versus bare bores, costs are only valid when a factor of the computation is the relative wear of each in a common period of service.

SINCE its first application just before World War II, the use of porous chrome plated cylinder liners in diesel engines has steadily increased. In three out of four types of U. S. diesel locomotives it is standard equipment. Sixty-five U. S. railroads have their worn locomotive cylinder liners reclaimed by this method. The U. S. Navy specifies it for its diesel engine liners and both the Navy and Air Force prescribe it on all aircraft engines at first overhaul. Various branches of industry are also tending toward the economies of chrome plated liners.

Technical qualities of such a porous chrome layer in diesel liners have been extensively and repeatedly discussed. It obviously must show a decided economic advantage, otherwise it would find no users. Granted, in view of its wide application, that it has such advantages, what might these be? One could think for instance of the reduction in loss of power due to liner wear and increase in ring-gap.

The most important factor, however, is cylinder wear as such, and the need for cylinder replacement caused thereby. If the economics of chrome plated versus bare bores are to be fairly compared, one important factor is this frequency of replacement. We must proceed on the basis of calculating cost of the liner *per unit of time.*

Factors of importance are: price of a new liner; price of a porous chrome layer; price of reclaiming a worn liner with electroplated iron and porous chrome; cost of pulling a liner from and installing in the engine. Downtime, an extremely important and costly factor, has been omitted because it is too difficult to evaluate.

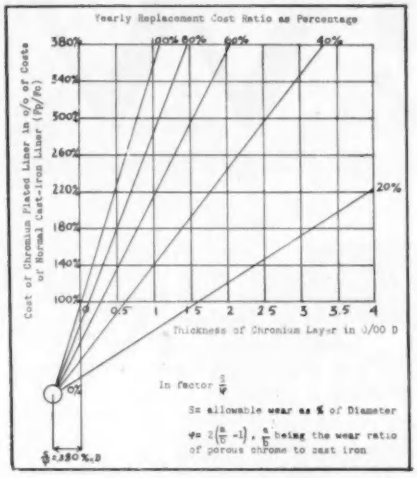
We will base our figures on a current type of 2-cycle diesel engine, developing 100 bhp per cylinder. The cost factors mentioned above are as follows:

Price of raw cast-iron liner		$175
Price of a cast-iron liner with porous chrome	0.020-in layer	$225
Price of reclaiming with porous chrome	0.020-in layer	$125
Cost of pulling and installing a liner		$ 40

Ratio of wear between chrome plated and cast iron liners is subject to variation. Consulting various investigators on the subject we find 5:1 as an acceptable average. Field reports on the type of engine investigated show ratios from 6:1 to 10:1. We will however, take 4:1 as a conservative figure.

Although not pertinent to this study, it has been found consistently with liners in service that even after the chrome layer is worn through at one point, the wear rate of the liner remains considerably under that of its cast iron counterpart. This rate averages two-thirds that of cast iron.

An explanation may possibly be found in the fact that although the chrome layer is worn through locally, the



Van Asperen nomogram showing ratio of yearly replacement costs of chromium plated vs special cast iron liners based on 0.020-in maximum wear.

rest of the liner is still protected. An added reason may be that the cast iron surface, being uncovered very gradually, is in a better position to acquire a favorable glaze.

We will consider the accumulation of costs over 60,000 hours of service assuming a rate of wear of 0.001-in per 1000 hr on cast iron. These last figures have, in this instance, no real significance as we are interested only in the relationship of costs. As maximum allowable wear, we will take 0.020-in on the diameter.

One raw cast iron liner($175) plus two replacement units and the cost of installation ($215 each) will be needed for the 60,000-hr service period. The chrome plated bores, considering the 4:1 wear ratio, will not only last through this period but will have a quarter of their life remaining. Tabulating this we find:

Liner Material	*Accumulated Cost*	*Unexpired Life*	*Total*
Cast Iron	$605	———	$605.00
New, 0.020-in Porous Chrome	$225	$56.28	$168.75
Reclaimed, 0.020-in Porous Chrome	$125	$31.25	$ 93.75

This shows a reduction in cost of approximately 72% by using new chrome plated liners and as much as 84% through reclaiming liners by iron—plus—chrome plating.

Another approach to an equitable comparison of liner costs would be to calculate the costs per 1000 hp hr. In this case we must figure on the basis of the total service life, adding the cost of pulling and installing a new liner so as to present the full cycle to restore as-new conditions.

Liner Material	*Liner Life*	*Increase*	*Cost— 1000 hp hr*	*Decrease*
Cast Iron	20,000 hr		1.08	
New, 0.020-in Porous Chrome	80,000 hr	300%	.33	.75
Reclaimed, 0.020-in Porous Chrome	80,000 hr	300%	.21	.87

While we save 69% on the extended portion of cylinder life when using new chrome plated liners, by reclamation that saving increases to 80%.

So far all of the calculations have been based on a fixed set of assumed conditions for the purpose of illustrating the approach. None of the values are absolute except as they pertain to these particular conditions.

Mr. F. G. Van Asperen, chief engineer, diesel engines, Werkspoor, Amsterdam, presented a paper at the International Congress of Internal Combustion Engines at The Hague, 1955, in which he presented a nomogram of interest. It showed the ratio of yearly replacement costs of chromium plated liners to those of special cast iron liners. His calculations were based on a maximum allowable wear of 0.66% of the liner diameter.

The nomogram shown was therefore redrawn, based on 0.020-in as allowable maximum wear. Applying the figures we used before, we find (omitting, as Van Asperen does, the cost of pulling and installing) the cost of a new chrome plated liner to be 129% of that of a cast iron one, and the thickness of chromium as a percentage of the diameter to be 2.28. The annual replacement cost ratio is below 20%.

Doing the same for a reclaimed liner we find the cost to be 71%. With the same thickness of chrome, the annual replacement cost is approximately 10% of that of cast iron.

Cylinder life however is not the only factor which is influenced by wear; efficiency of engine operation and frequency as well as length of downtime are others. Although the relationship in this case does not seem to have been thoroughly investigated, we may assume for the purpose of argument that the relationship is exponential to liner life. Although this may seem exaggerated, it is often found in marine operations that the loss due to a day's downtime is of the order of 1% of the ship's value.

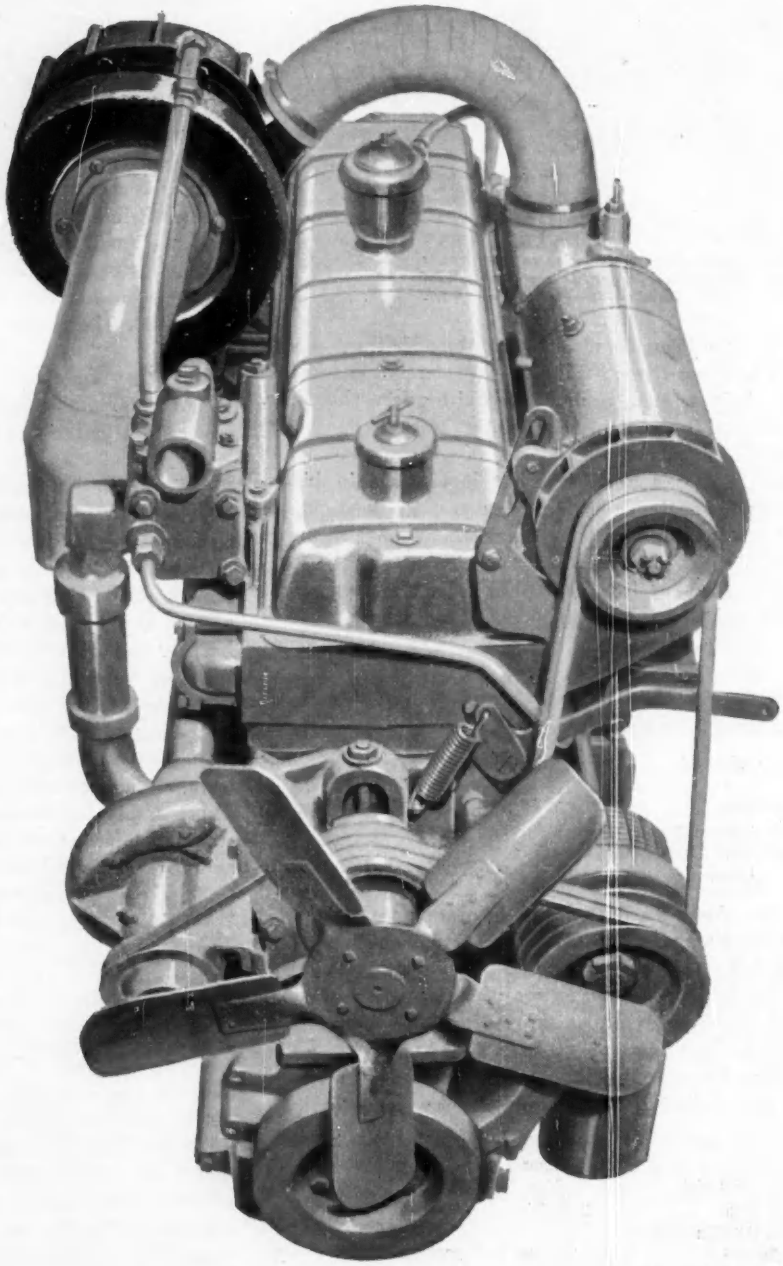
The figure which should then give us an indication of the influence of wear and downtime is the time-wear integral of the wear curve of a particular liner. For those so disposed, this may be computed but to give an idea of the results obtained, the results of integrating over 80,000 hours are tabulated here:

Material	*Time-Wear Integral*	*Reduction*
Cast Iron	533 inch-hr	
New, 0.020-in Porous Chrome	177 inch-hr	66%
Reclaimed, 0.020-in Porous Chrome	177 inch-hr	66%

Where in earlier calculation we found reclamation to have the edge over new, viewed from this last aspect, it has of course no decisive advantage. This last saving is to be considered separately and over and above the cost savings calculated before.

None of these figures can, of course, make any claim to absoluteness but they may serve the interested reader to make his own calculation, based on whatever figures he has available himself. Whatever the approach used, the economies of chrome plated cylinder liners are demonstrated.

new



CUMMINS JT-6 TURBODIESEL

Brake horsepower 175
Governed RPM 2500
Bore and stroke . . . . 4⅛" x 5"
No. of cylinders 6
Piston displacement 401
Net weight with standard accessories 1615

In 1952, 1953, and again in 1954

Cummins Diesels powered more new trucks than all other makes of diesels combined!

and now standard in these famous-make trucks

Diamond T | Four Wheel Drive | Hendrickson | International Harvester | White | White-Freightliner | Kenworth

175 h.p. Cummins Turbodiesel!

MUCH SMALLER . . . MUCH LIGHTER . . . THAN DIESELS OF COMPARABLE POWER!

Let this new, lightweight 175-h.p. Cummins make more profit for you! Here are all the advantages of diesel power minus the handicap of excess weight. Cummins Turbocharging harnesses the energy in normally wasted exhaust gases . . . makes possible this higher powered *small* engine. (The JT actually weighs as much as 800 lbs. less than diesels of comparable horsepower.)

More than twenty-five million miles of on-the-job performance have proved that this new turbodiesel delivers unmatched fuel and maintenance savings. Like all Cummins engines, it features simple, rugged, heavy-duty design. And the exclusive PT fuel system, far simpler to maintain and service than gasoline carburetion and ignition or any other diesel fuel systems.

The JT is built for profitable service anywhere in the country. For use in states having a 42,000-pound weight limit. For short haul operators who don't run up big annual mileages—or for cross-country operators who need lots of power over sustained periods.

CUMMINS gives you the big plus **MORE PROFIT**

Cummins Engine Company, Inc.
Columbus, Indiana

Please send me, without charge or obligation, full details on the new JT Turbodiesel.

_____I am interested in using the JT in new trucks.

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DP-1255

Melley's spotless trucks are kept busy hauling engines and parts with . . . .

even his car being used in a pinch.

Talking Shops

It's 2 o'clock Sunday afternoon in Pittsburgh, Pa. A steel mill in Youngstown, Ohio is on the phone and they want an engine rebuilt in a hurry. You take the wife for a Sunday afternoon drive and pick up the engine in the trunk of the car, where it stays till you go into the shop the following morning.

By Wednesday morning the engine is completely rebuilt and ready for run-in. Late that afternoon, the engine is crated, loaded (on a truck this time), and on its way back to the steel mill along with another engine picked up a day earlier.

That 2 o'clock call however could just as well have been in the AM. This is the story of Melley Motor Supply—SERVICE—Ed.

IN four years Joe Melley has whittled his customers down to just three in number. This may sound a little strange, but the set-up at Melley Motor Supply is somewhat different than that normally found in an engine rebuilding shop. The three customers consist of three steel companies which, when broken down into different departments, constitute a large number of customers. But lets have Joe Melley do the talking . . .

Q. Joe, can you give us an average figure on the number of complete engine rebuilds you turn out in a month.

A. This averages close to 50 engines each month, and most of the time we have a backlog of between 30 and 40 engines of all types and sizes.

Q. How about these sizes and types?

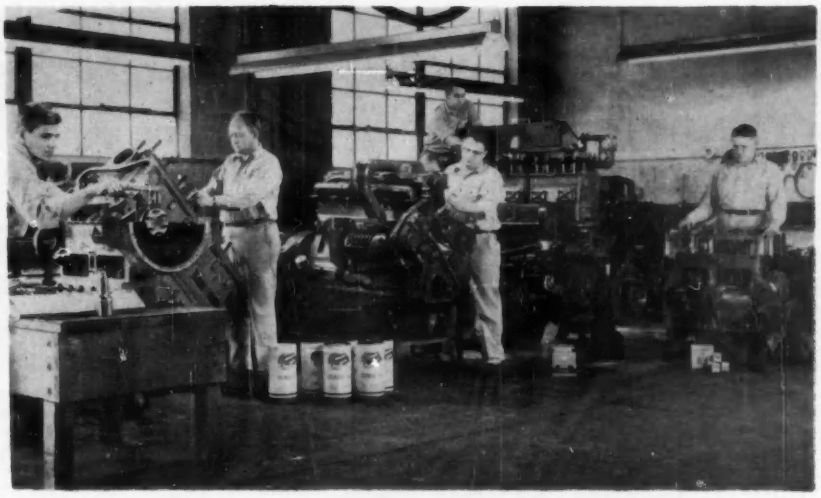
A. These range from small 1-cyl gasoline engines up to Cummins Model L's, Waukesha WAKD's and Buda 1879's.

Q. Do you rebuild anything else aside from engines?

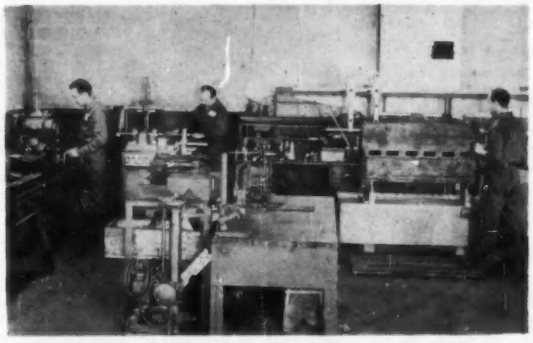
A. Occasionally we rebuild driven equipment as well as the engine. This usually happens when an engine-compressor or an engine-generator set is skid-mounted and is removed as a unit.

Q. You mentioned an output of about 50 complete rebuilds per month Joe, how many men does it take to handle this work load?

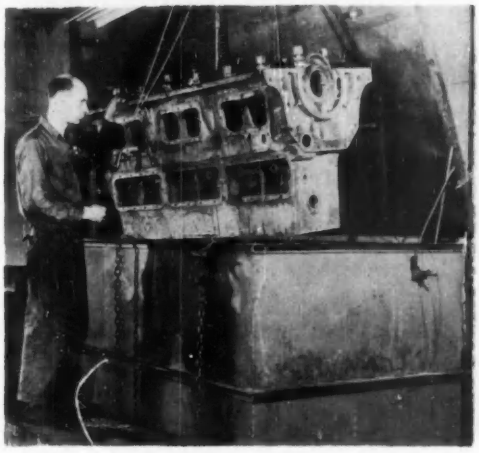
A. Let me give you the breakdown of the men and the jobs they do and you take it from there. There are two men to handle cleaning and teardown; one for superchargers and rocker assemblies; two for electrical equipment, water and oil pumps, and carburetion; one for cylinder heads; two in the injection shop; two on parts; seven for engine assembly, of which two handle any machine shop work; one truck driver; and one carpenter for crating engines. All these men work right in the shop. We do not do any work in the field and only use our



It would take a lot of space to catalog all the various makes and models of diesel and gasoline engines rebuilt at Melley's Shop. Four engine manufacturers are represented in this shot of the "build-up" line.



Machine shop area is equipped with a lathe, Tobin-Arp line boring and piston pin fitting machines, Sunnen hone, Kwickway valve refacer, cylinder boring bar, "Vibra-Motive" surface grinder, and a Van Norman piston resizer.



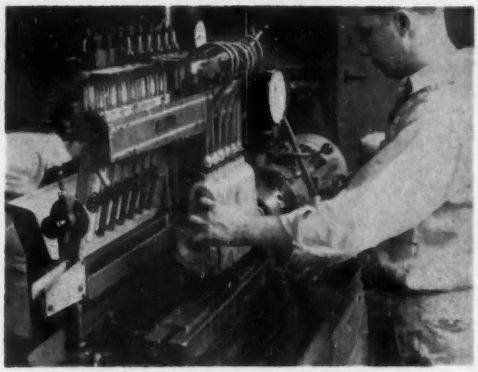
In the receiving room which contains dozens of different make and model engines awaiting rebuilding, engines are disassembled and tagged. Following this all parts are cleaned in the hot tank with a solution of Oakite No. 29.

trucks for picking up and delivering engines. I might point out that we only handle complete rebuilds and when the engine comes in the shop, it must be equipped with all components necessary for its operation. We accept no short blocks or engine assemblies for working over.

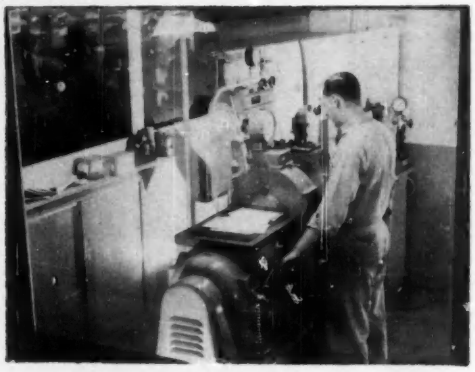
Q. We notice you have a good deal of space allotted to the injection equipment department Joe. Is all this necessary to handle the injection equipment from your rebuilding operations?

A. No, not entirely. In addition to our normal work load, I am the local dealer for Robert Bosch equipment. This adds a good deal of outside work on injection equipment to what we would normally have from just rebuilding engines. Our equipment here is comprised mainly of three Robert Bosch test stands. One handles multi-plunger pumps another, individual-type pumps of the sizes normally found on locomotive diesels, and the third is for running-in injectors.

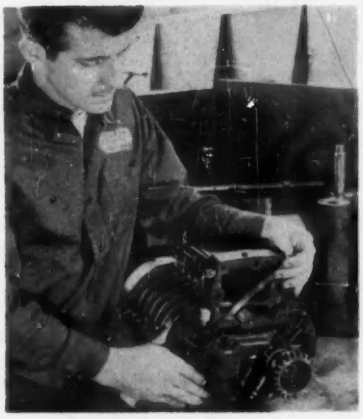
A birds-eye view of the electrical, blower, and pump rebuilding departments from the "coffee shop." Located on a balcony above one of the injector test rooms, a 40-cup urn makes the 9am and 3pm "breaks" more pleasant.



A Robert Bosch test stand is used for calibrating multi-plunger injection pumps. Melley's pump room men have designed and fabricated adapters for this stand making possible the calibration of any unit-type pump serving a multi-cylinder engine, while . . .



individual-type injection pumps are tested in another room on another Robert Bosch test stand. Also in this room is a third test stand of the same manufacture for "running-in" injectors at the same speed they would actually operate in an engine.



Superchargers and blowers are rebuilt at one location. Like oil and water pumps, and rocker assembly cases, etc., the unmachined surfaces of the casting are coated with red oxide (crankcase sealer).

Cylinder heads are done in another department. The equipment used is Kwickway. This fellow does not do the rocker assemblies as heads for an average of 50 complete rebuilds each month keep him pretty busy.

To broaden the usefulness of our multi-plunger-type test stand, we have built adaptors which enables us to test any fuel injection pump which serves a number of cylinders.

The injection shop is divided into three interconnected rooms, all of which are totally enclosed and air conditioned. One room houses cleaning equipment while the others are for testing and repairing. The stand for the individual-type pumps is in one room and the stand for multi-plunger type pumps is in the other along with nozzle popping equipment and a stand for testing unit injectors. The latter stand was built right here in the shop.

Here is an idea which may benefit someone in another shop. The boys in the injection shop store all leather oil seals in a solution of 50% neatsfoot oil and 50% engine oil. This permits seals to be kept on hand for long periods with no chance of them drying out or shrinking, and at the same time keeping them readily accessable.

I would like to point out the third Robert Bosch test stand which we have not talked about. This machine is equipped so that we can actually "run-in" an injector at speeds comparable to those it would operate at in the engine.

Q. How about a look at the machine shop area now Joe?

A. Sure. Our equipment here includes an align boring machine, surface grinder, piston pin fitting equipment, valve refacing machine, piston resizing machine, and a lathe. One of the mechanics who regularly assemble engines handle most of the machine shop work. In many cases where we can't get a part in time to meet delivery, we will either make it up if it is not too complex, or else have it made locally.

Q. Suppose we take an engine which has been picked up from a customer, what happens when it is unloaded at the shop?

A. If it is a rush job, one/or both of the teardown men go right to work on it. Parts are placed in baskets, cleaned in the hot tank and tagged with the job number. After parts and assemblies are inspected, the parts man makes out a list of the new parts needed for the rebuild

and assembles them in one spot for the assembly mechanic to pick up.

Assemblies such as fuel injection equipment, electrical equipment, cylinder heads, etc are sent to their respective departments for servicing or rebuilding.

Q. Let's talk about painting for a minute Joe. We notice all the rebuilt parts are freshly painted as are the finished engines.

A. We make a practice of painting engines and component assemblies with the color that matches the equipment they power, for example Caterpillar Yellow, International Harvester Red, Allis-Chalmers Orange and so forth. In addition, the unmachined surfaces of castings, whether they be water pumps, lube oil pumps, superchargers or cylinder heads are coated with crankcase sealer. You may also have noticed that we use a great deal of paint in pressurized containers. We have found that these small cans of paint are worth the cost since they eliminate the time required for a man to set up a spray gun and later clean it. We do however, use a spray gun for large jobs.

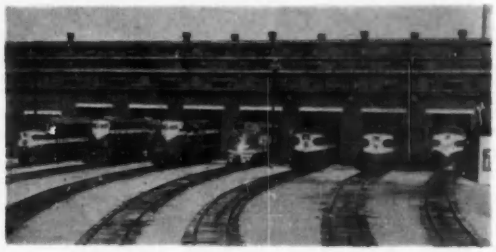
Also, we spray machined surfaces of all parts with either "Miracle Oil" or "Miracle DGF". Both these products are packaged in the small pressurized cans. The "DGF" is a graphite dry-surface lubricant and is sprayed on all mating surfaces whether parts are for immediate build-up or for storage.

Q. One thing has us wondering—we have neither seen or heard of a shop foreman here.

A. We have no need for a shop foreman. Each man has a job to do. Sometimes it takes longer than the normal day. It is general knowledge in the shop just what engine has to be ready at what time. When an engine has to go out by a certain time, it goes out. As far as picking them up, it doesn't matter when the customer calls, day or night, we go after it then. Service and precision rebuilds are the basis of this business. The only thing our customers want to know is when they can have the engine back in service. There is no question as to whether it will run properly when it gets back to the job—it has to.

Q. What do you do as far as grinding crankshafts and camshafts?

A. All our crankshafts and camshafts are sent to the Pittsburgh Crankshaft Grinding Company. Their service matches ours when it comes to a rush job. In many cases Sam Capriotti, the owner has come out in the middle of the night to grind a shaft for us. In a way, this is a perfect setup for us.—Pittsburgh Grinding is directly across the street from Federal Mogul. When we have a rush job, we send the shaft over, and Sam does the rest. He will clean the shaft up to the next undersize, then walk across the street and pick up the bearings and return them with the finished shaft. Incidentally, our shafts come back with a 6 rms micro-inch finish.

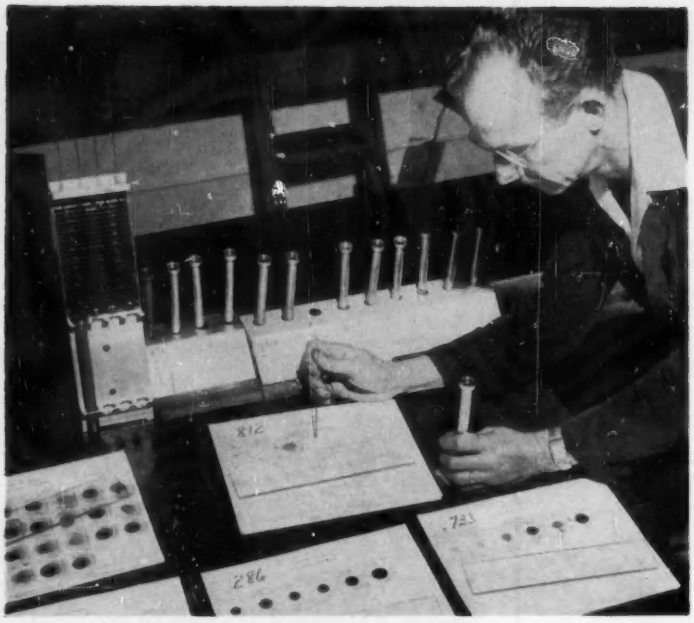


Mo-Pac Modernizes Diesel Shop

LITTLE ROCK, Arkansas was the place, and the date was November 13th. This was the day Missouri Pacific Lines held open house, permitting a complete inspection of its huge, newly remodelled diesel facility by all the rail road's employees, their families, friends and other specially invited guests.

Following the completion of the major phases of a tremendous reconversion program necessitated by the dieselization of Missouri Pacific's system lines, the North Little Rock facility held "Open House". The purpose was to show what had been accomplished at what was over several years of work and the expenditure of almost a million dollars.

The North Little Rock facility takes care of all the diesel locomotives regularly assigned to the railroad's Southern District. While some require only routine inspection, washing and refueling, others undergo major maintenance work but altogether they average 100 locomotives per day handled through the facility.



One drop of oil is placed on the special filter paper and examined. One of these record sheets for each vehicle is kept in the file so that a progressive record of the oil condition is available for comparison with results of previous checks.

Simple Oil Tests Improve Diesel Maintenance

By Torrens A. Smith, Superintendent of Equipment, Louisville Transit Co.

Here's another article in our series designed to cover various aspects of field evaluation of used lube oil. This series is intended solely as a guide. Its purpose is to aid operators in getting maximum oil and filter element life without imposing other maintenance penalties on the engine. We emphasize that none of the data given here or in future articles is necessarily specific to your operation. Type of service, engine condition and the quality of maintenance will all alter the condemning factors. To these you can add the type and make of engine, the filtering system, the lubricants used and even the fuel in some cases. For example, in this article the tests given for acidity pertain to alkaline oils such as the Shell product used. Other oils may be compounded to be on the acidic side even when new. Hence, this test would not apply to them. We want to create an awareness of the factors inherent in the overall problem and outline approaches you can use to find your particular solution—Ed.

"SAY, Ed, I just looked at a drop of oil from our No. 286 diesel bus. I think we may have to replace a blown head gasket in that engine."

Perhaps this sounds like a rather ridiculous statement to a maintenance man, but anyone familiar with the recently introduced ADC* Oilprint Analysis will agree it is not as far-fetched as it might seem at first glance. Certainly the men in both shops of Louisville Transit, who have been working with this new maintenance procedure since late May of last year, know that a single drop of oil can show the presence of water very distinctively.

Water in the lubricant means one of two things: (a) condensation due to lots of stop-and-go service or short-haul driving, or (b) leakage of coolant. If you are familiar with the type of service a given bus or other diesel-powered unit has seen, you will know whether it may be condensation. If it isn't, then water is caused by a blown head gasket, a leaky injector tube, or a cracked block, in about that order of frequency.

In addition to showing up even very small quantities of

**Trademark, Shell Oil Company*

water, the ADC Oilprint Analysis is useful in many other ways. Here is what you can learn from two drops of oil:

(1) *Detergency/Dispersancy*—Any engine oil, to be most valuable, should possess high detergency so that it will clean the engine and keep it clean. Coupled with it is the oil's dispersancy. This is its ability to keep soot particles and other contaminants in suspension so that they will not settle out on moving engine parts in the form of sludge. Both detergency and dispersancy of modern lubricants are usually quite high but decrease as the oil continues in use. The oilprint will indicate when the dispersancy is no longer adequate.

(2) *Contaminants*—Improper setting of fuel injectors, worn nozzles, afterdrips, clogged air filters or ducts, or any other condition which causes too rich a mixture will result in more unburned carbon than would otherwise appear. Under these conditions engine oil darkens unusually fast and the oilprint will show that some adjustment or repair is needed.

(3) *Alkalinity*—It has been well established that engine wear increases as the oil becomes acidic in nature. Most engine oils start out on the alkaline side, but combustion products have a tendency to destroy this alkalinity. If continued in use, the oil will eventually turn acid. A special indicator developed by Shell Oil Company's Martinez research laboratory, and used as a part of the ADC Oilprint Analysis, tells at a glance when the oil's alkalinity has been depleted.

Lubrication Procedures Revised

Louisville Transit operates 397 active buses, of which the majority are diesel-powered GM units; the remainder are gasoline-driven buses manufactured by White, GMC, and Mack. Because our records show that operating expenses for the diesel units are lower, we use them for all-day service, filling in with the others during rush hours and on special occasions.

All buses, regardless of fuel used, are on a very rigid maintenance schedule. Because we feel that we can operate most efficiently and economically only if we keep each vehicle in first-class shape, we schedule an inspection for each bus at every 3000 miles. And when the 3000 miles are up, that bus *must* come into the garage for its "physical". The check-chart, lists the various items which are taken care of at regular intervals.

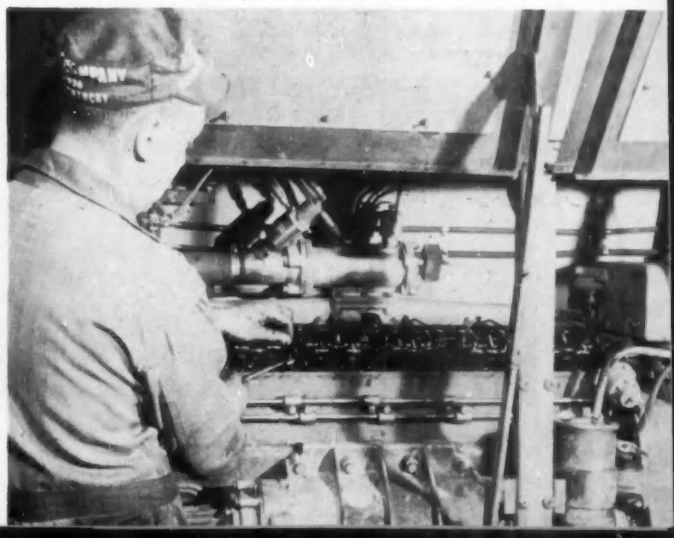
Lubrication is one factor which we consider particularly important, and for this reason we used to change oil on all buses after every 6000 miles. In addition, we used to change the filter element on diesel buses every 3000 miles, on the gasoline rigs after 6000 miles.

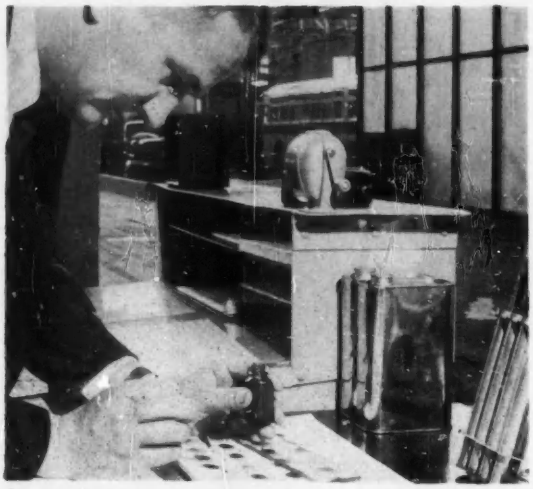
Now that we use the oilprints to check up on our buses, however, we find that we can leave the oil in the crankcase for an average of 8000 to 9000 miles before the analysis shows that the oil needs to be drained. At the same time, should an oilprint indicate that because of some malfunctioning of the engine the lubricant has to be replaced much earlier, we of course do so . . . and also take steps to correct the engine trouble. New filters, incidentally.

After being withdrawn from the crankcase by means of a suction pump, the oil is transferred into a stainless steel test tube.

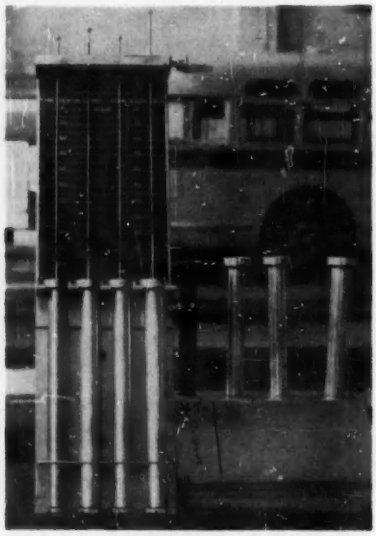
More representative oil samples and better results were obtained by tapping between the oil pump and the filter.

When oil print indicates water leakage, mechanics get to work immediately to locate the trouble. Most often a blown head gasket has to be replaced.





Alkalinity is checked on a separate sheet and results noted after one minute. Special indicator turns red if oil is acid and needs changing.



Falling ball type indicator is used to check fuel dilution of lube oil. A five point (5%) viscosity change from the reference oil (actually only 1% fuel dilution) means oil is to be replaced. This low figure indicates a very rigid viscosity control over lube oil.

General view of Louisville Transit Co. main shop for major overhauls and unit rebuilding. Even dynamometer testing is done here.

are now installed every 6000 miles on *both* types of buses, diesel and gasoline.

Because of the longer oil drain periods, our shops have found that they can handle their maintenance work without any backlog, using four pits. Formerly, with five pits going full tilt, it was not uncommon to have a long list of buses waiting for a check-up.

Oil level of each bus is checked each day, and new oil is added as needed. The amount of make-up depends, of course, on the individual vehicle, its age, its type of service. For the newer diesel units in our fleet, make-up ranges from ½ to 2¼ gal per month per bus. which represents an average of 2060 miles per gal of oil.

Older buses consume from three up to as much as 14¼ gals per month, with correspondingly lower oil mileages. In any event, if the men in the maintenance department notice that a bus is getting less than 300 miles per gal of oil, they schedule an engine overhaul.

Oilprints Spot Mechanical Trouble

Since using the oilprint analysis, we have cut down on our oil consumption, as well as on the time we have to spend in the maintenance of each vehicle. However, to us these savings are not half as important as the fact that this system permits us to discover several types of engine trouble before they develop into anything serious.

Should the oilprint show evidence of water in the crankcase, we first look at the operating record of the vehicle. If it has been used for tripper (short-haul) service continuously, we immediately suspect that the water is due to condensation. Condensation is usually found in a cold-running engine, particularly in a service such as ours where idling time is close to 50%.

Experience has shown that a bus has to travel at least 14 miles in order for the oil to reach its normal operating temperature of about 130°F, and much further if any condensation is to be driven off. To verify the accuracy of the ADC Oilprint Analysis, we have on occasion put a tripper bus, having condensation in the oil, on all-day service, and have then checked another oilprint at the end of the day.

Invariably, the water was driven off and no trace of it was found in the second oil print—IF originally due to condensation. Of course, where the water is due to leakage of coolant, all-day service does not evaporate it; rather, the second spot shows more water than the first. Usually this leakage is remedied by installation of a new head gasket or injector tubes.

Oilprints will establish coolant leaks even more definitely if anti-freeze is being used. Ethylene glycol shows up very distinctively and alcohol is also noticeable. With some training and experience it soon becomes quite easy to differentiate them. Actually, Louisville Transit does not use any anti-freeze materials, because the company has enough heated garage space to house all idle vehicles in the winter-time.

The soot load (unburned carbon) found in an oilprint also tells much about the engine's operation. After working with this new system for awhile, we can tell fairly

closely how dark a print should be for the usual mileage intervals. However, if a spot of oil darkens too fast, we try to find out what causes it.

One of our buses, for example, had gone only 79,000 miles since its last major overhaul. Knowing that most of our vehicles can do at least 125,000 miles—and sometimes as much as 200,000 miles—before needing another set of rings and cylinder liners, we saw no reason why the oilprints on this vehicle should show an excessive soot load. We did not think it could be caused by blow-by, and the injectors had just recently been adjusted for optimum performance.

We changed the oil, and again the oilprints got too dark. What caused it? An alert mechanic noticed that the flexible duct leading from the air intake to the filter had collapsed, and was actually starving the engine for air. As soon as it was replaced, the oilprints behaved normally.

Using the Oilprint

As maintenance programs go, we can think of nothing simpler or quicker than the ADC Oilprint Analysis. Simple, because all you need is two drops of oil from the crankcase; fast, because it can be done right on the spot without any expensive test equipment. Also Shell makes no charge for the service.

We used to withdraw the oil sample to be tested directly from the crankcase, using a suction pump. However, we found that quite often the sample was not representative, its make-up depending on just how deeply the suction tube had been inserted. We now disconnect the pressure line just ahead of the oil filter and crank the engine, without starting it, until we have filled a test tube with oil. Although we do not necessarily recommend disconnecting couplings any more often than necessary, we find that by doing so we get a sample of the oil exactly as circulated to the engine.

A drop of the oil is then transferred to the special filter paper supplied by Shell and the drop is allowed to migrate into the paper. If the drop is dark enough to obliterate a pencil line (No. 2 pencil) previously drawn on the paper, we consider the soot load too heavy, and the oil is changed.

Dispersancy is checked by noting the pattern of the spot after drying. If the spot is fairly uniform in color, and a lacy pattern extends all the way to its outer edges, dispersancy is still sufficient. On the other hand, if a dark hard core appears in the center and clear oil has diffused further out, the oil no longer has enough dispersancy. Just as it dropped its burden on the paper where it first hit without carrying it along in suspension, so will it deposit the soot and sludge on vital engine parts. The oil is changed.

The oil print used to check dispersancy, contaminants and soot load is kept on a permanent record sheet, one for each bus. A second drop of the oil is placed on a separate sheet, where through the use of the special Shell indicator we check the oil's alkalinity. Some indicator is dropped on the oilprint, and the color is noted after one minute. If it has turned blue, the oil is still alkaline; if yellowish, the oil is neutral and may be retained, although it would be wiser to change it. However, if the spot turns orange or red, the oil is acid and must be drained.

The ADC Oilprint Analysis has proven exceedingly useful in our maintenance program. Although not designed to replace a full-scale laboratory analysis of used engine oils, the oilprints do yield most of the information we need to know. Their primary advantage lies in the fact that they show conclusive results in about two minutes and corrective action can be taken immediately.

What Do You Know!

Here are some questions to test your general knowledge of the diesel field. Make your selections, then turn to Page 75 to check them.

1. A good lube oil having a high dispersancy value is better able to—
   a. pick up solid contaminants.
   b. prevent solid contaminants from forming in the oil.
   c. hold soot particles and other contaminants in suspension.

2. If a bus or truck operating in short-haul service shows some traces of water in the lube oil, it is most probably due to—
   a. leaky head gasket.
   b. cracked liner.
   c. condensation.

3. What would you say is the distance that a diesel-powered bus has to travel before its lube oil reaches a normal operating temperature of, say, 130°F?
   a. 3 miles
   b. 8 miles
   c. 14 miles

4. What would you say is the average distance that a diesel-powered bus travels per gallon of lube oil if the engine is in good condition?
   a. 1500-2000 miles
   b. 1000-1500 miles
   c. 2000-2500 miles

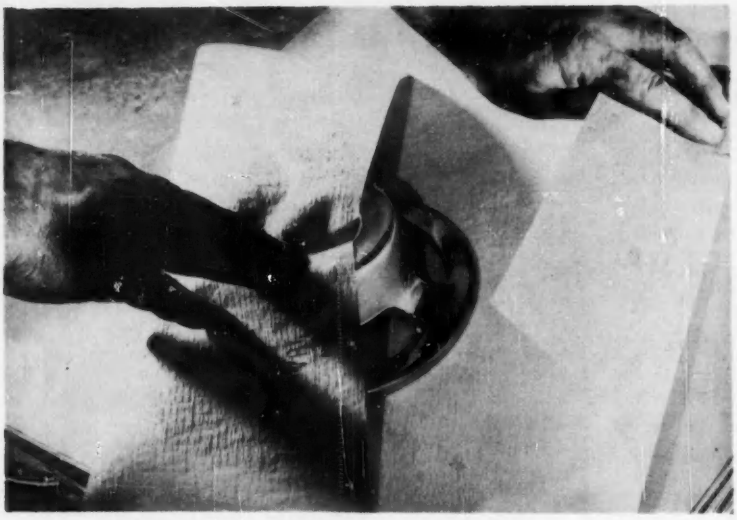
5. A 2-cycle diesel does not produce enough exhaust energy to operate a turbocharger and supply sufficient air during starting without the assistance of a scavenging pump, blower, or other auxiliary devices.
   a. True b. False

6. In addition to its greater output, a turbocharged diesel runs more quietly than a similar mechanically supercharged or normally aspirated engine.
   a. True b. False

7. A dual-fuel engine using natural gas of 915 Btu per cu ft and burning about 9600 Btu per kwh is considered to be operating—
   a. wastefully and needs improvement.
   b. in the economic range of most of the modern dual-fuel engines.
   c. extremely economically.

8. There are several ways to preserve engine parts in storage. Below are three types of protective materials and three separate items to be protected. Match the most typical application for each preservation.

a. oil preservatives	1. a rebuilt "short" engine block
b. plastic coatings	2. a timing gear
c. vapor inhibitors	3. a fuel header



VPI Wrap which has been creped to stretch is used to protect odd shaped parts against rust. Vapro rust inhibitor paper protects valves.

Stop Rusting

Small investment in rust preventives stops large losses from engine parts made useless by corrosion during shipping and storage.

IF you stock metal parts you're well aware of the dollars down the drain resulting from parts made useless by corrosion and rust. You're also aware of the time and labor involved restoring rusted parts to usable condition —if possible. Unfortunately, those who stock parts are not the only ones affected. Anyone trying to sell a part even only slightly rusted knows how difficult it is.

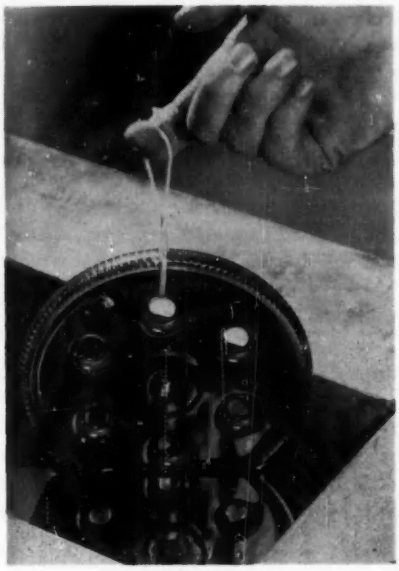
That old saying about "an ounce of prevention. . ." certainly would have eliminated a lot of misery if it had been put into practice. By protecting the metal surface with one of the rust preventive materials available, the problems and headaches encountered by those who stock, sell and use metal parts would be eliminated. Items such as crankshafts, liners, pistons, bearings, conrods, valves, injectors, etc., all of which are precision made and highly polished would no longer have rust small pox.

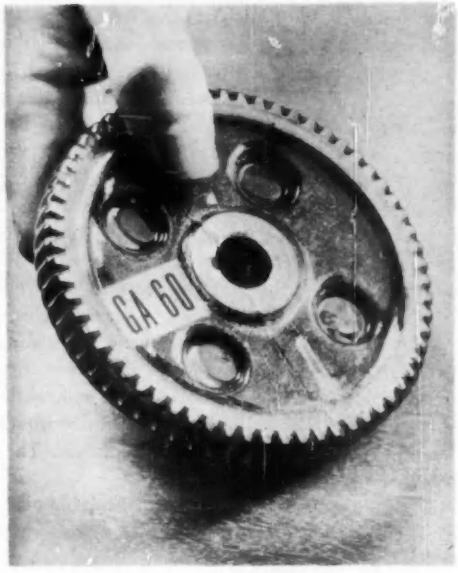
According to the June, 1955 issue of "Lubrication", published by the Texas Co. the problem of rust prevention is still the subject of intensive research and for good reason. The annual cost of iron and steel rust in the United States is over 6 billion dollars—one of every 50 tons of iron and steel reverts to oxide form—rust. Although this does not specifically apply to our diesel field it's an indication of the tremendous problems and losses suffered by industry.

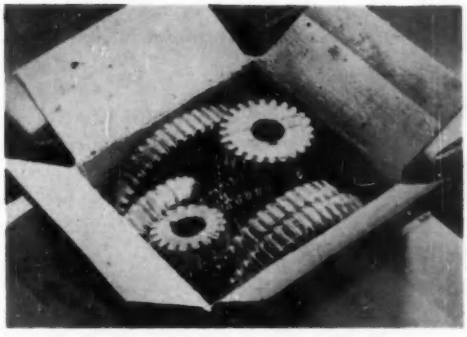
A case which does apply to us however, occurred during World War II, a period of time when great advances were made in developing protective materials. This involves a case where injectors on brand new engines shipped to jungles in the Pacific area were completely ruined in an hour. The cause was traced to rust in the engine fuel gallery picked up by the fuel and carried to the injectors. It so happened that these fuel galleries were the only engine parts not efficiently preserved.

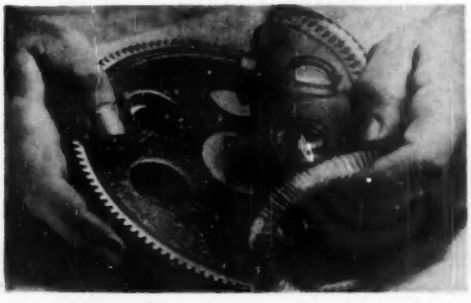
The most common cause of ferrous metal corrosion is the presence of moisture and air. However, other forms are encountered under special conditions such as electrolytic corrosion traced to the presence of stray electric currents, and chemical corrosion due to corrosive gases or liquids. An example of the latter occurred when corrosive fumes from a processing plant in Newark, N. J., ruined diesel parts stocked in a nearby warehouse. However, nothing was done about it until military aircraft at the Newark airport were also affected.

There's no excuse for the losses due to the corrosion that occurred in the above cases. There is a rust preventive for every application whether it be for exterior or interior parts of engines. The common rust preventives we'll discuss fall into three categories—petroleum base, plastic and vapor.









Picture series shows: simple method of dipping a gear in butyrate composition; identification visible through transparent plastic; outside container for shipping; method of puncturing plastic coat with sharp point; coating being peeled off like a banana easily and quickly.

Petroleum Base Coatings

Petroleum base coatings are most widely used. They form a protective barrier and through special chemicals inhibit the metal surfaces against attack.

Most preservatives give best results when applied to clean dry surfaces. However, they're often applied under adverse conditions. An understanding of the condition under which protection is desired is necessary to make the proper selection.

Protective oils and fluids are generally of low viscosity and form non-drying oil films for temporary protection under mild corrosive conditions. Straight mineral oils give some protection for rough surfaces, but last a short time under even mild conditions. For temporary protection of machined surfaces even indoors, oils or fluids with anti-rust additives are needed.

Fluids are desirable because they're easy to apply and leave an oily film of desired thickness and viscosity after the solvent evaporates. Oily film coatings can be applied by dip, spray, swab or brush.

They are designed for protection of hand tools, small parts, bearings and highly machined surfaces under mild conditions of storage and packaged shipment. They often protect parts wet with water or soluble oil from machining operations, as well as parts handled by hand under

high humidity. For such applications, special water displacing and finger-print removal-suppression characteristics are also a must. Oily films are removed by wiping, solvent washing, or hot water washing when parts are to be processed, plated, or used.

For long-term protection under more severe conditions, "soft film" coatings are used. These range from thin transparent films to heavy wax-like coatings. The latter are for protection in corrosive atmospheres. They give long-time protection in all weather and even under submerged conditions. These coatings are removed by wiping with a kerosene cloth or solvent washing.

Although these coatings may have self-sealing properties, use of "hard film" coatings is recommended where repeated abrasions of the surface are anticipated. These consist of fluids forming hard solvent-deposited coatings of bitumen, alone or with asbestos fillers. They can be removed by painter's naphtha.

Under excessively wet conditions, soluble oils are used. They emulsify with water, preventing free water contact with metal surfaces. But emulsion breakdown under long storage results in free water and rusting.

Regardless of the parts or the condition, there is a petroleum base rust preventive for it. Now for. . . .

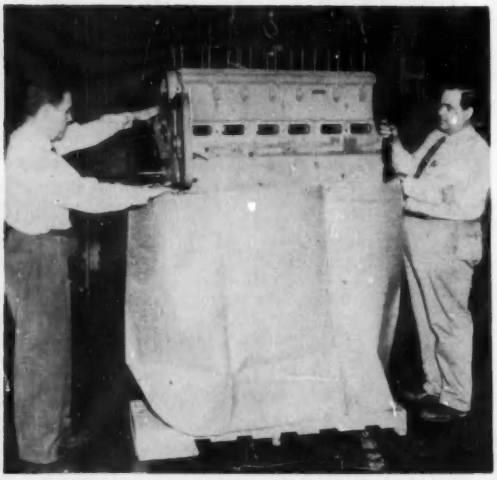
Plastic Coatings

A butyrate peelable plastic coating, developed by Eastman Chemical Products, Inc. of Kingsport, Tenn. is one such material. This coating, "seizes" the product, so to speak, regardless of its shape or size and becomes a combination skin-tight cushion and protective wrapper. The rust inhibiting oils in the butyrate plastic itself combat corrosion and act as a lubricant. Some standard container or crate is then only necessary.

To apply, dip a gear, conrod, bearing, crankshaft etc. into 300°-325°F butyrate composition. This is done in a tank, large enough to accommodate the largest piece to be coated and is placed in any convenient spot in your warehouse or shop. The protection is complete and lasts as long as there is no break in the coating. Its high tensile strength and good elastic quality makes it difficult to break through the coating.

No further wrapping and usually, no labeling is required since identifying marks are visible through the transparent coating. Parts so protected are instantly available for use since upon slitting the coating it peels away like a banana. The coating can be re-melted repeatedly having undergone no chemical change. As for. . .

Where 37 men handled 850,000 lbs. of oil-dipped equipment, now 26 men pack and ship 1,420,000 lbs of engine blocks and parts



Vapor Rust Control

This is done by the use of Angier VPI Wrap developed by the Shell Development Co. It is a special packaging paper coated with an organic chemical compound that vaporizes very slowly. When used to package metal parts, no matter of what shape or size, this vapor assures protection against rust. Since no greasy coatings are to be removed, de-preservation is eliminated.

VPI is a crystalline organic compound which slowly forms an invisible, odorless, non-toxic and rust inhibiting vapor. It stops a ferrous surface from reacting with oxygen and moisture in air. There is protection against corrosion as long as VPI vapor is present in the surrounding air. VPI on one square foot of paper is enough to render non-corrosive about 20,000 cubic feet of air at room temperature.

Actually all that is necessary, is to wrap a set of rings, piston, conrod, crankshaft or even a complete machine with VPI Innerwraps or VPI Barrierwrap (a heavier paper for long-term protection or for rough handling) and the vapor given off does the rest.

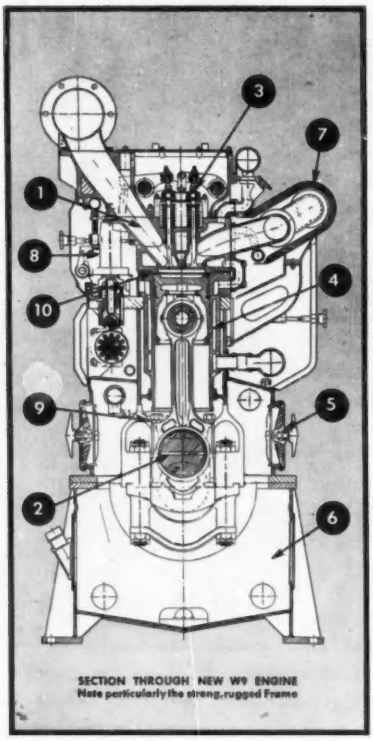
Combination Protection

So far, only preservation of individual engine parts, tools, etc., to be stocked or shipped have been discussed. A single type of preservative is generally sufficient here. But perhaps complete engines must also be shipped and stored, and therefore preserved. The complexity of the job calls for a combination of protective techniques.

Bright interior parts, normally oil coated, can be fortified by flushing and flooding with a special oil, high in preservative additives. Exterior metal, not otherwise protected, is a cinch for some of the harder petroleum base coatings. All openings should be closed to bar entry of dirt and also moist or corrosive air. This suggests the use of the VPI material either for the closure or as an insert prior to sealing up the engines.

These are just a few ideas; application of preservatives is as broad as the imagination.

The cost of preventive maintenance is small compared to replacing or reprocessing damaged parts. Intelligent use of protectives can and have reduced those dollars down the drain and other headaches arising from the lack of suitable preventive rust maintenance.



SECTION THROUGH NEW W9 ENGINE
Note particularly the streng, rugged Frame

1 ***Jet-swirl air intake passages*** give maximum air turbulence for complete fuel-air mixture and best fuel economy.

2 ***Massive crankshaft***

3 ***Hydraulic valve lifters*** eliminate clearance adjustments, give quiet, efficient operation.

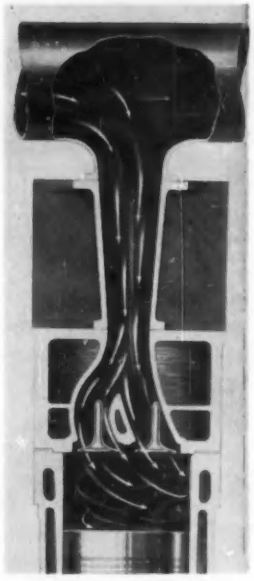
4 ***Cast-in-cylinder water jacket*** eliminates sealing rings between crankcase and water jacket — eliminates possibility of lube oil contamination.

5 ***Large, easily removed inspection doors*** make maintenance easy and do double duty as spring-loaded pressure relief covers.

6 ***Welded steel base*** can be mounted on flat surface or made to suit any existing structure — provides maximum strength with minimum weight.

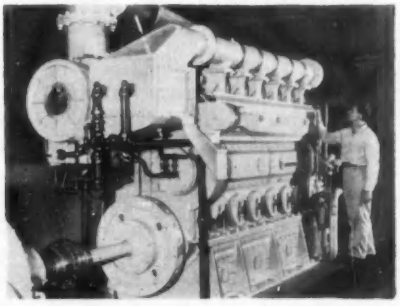
7 ***Dry insulated exhaust manifold*** reduces cooling water requirement — provides extra energy to turbochargers.

Of course, the new W9 engines have the same features found on larger Worthington engines: separate fuel pumps 8 for each cylinder, four-bolt connecting rods 9 and head design 10 that eliminates need for gaskets.



Worthington's W 9

A compact, turbocharged 4-cycle engine, designed to operate above 200 bmep, is Worthington's latest contribution to the demands for higher output in smaller packages.



The W 9 has a 9-in bore, 11-in stroke, is 4-cycle and is either 6- or 8-cyl ranging from 400-hp to 1400-hp at speeds up to 1000 rpm.

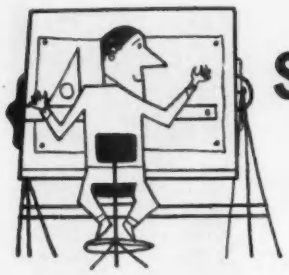
RATED 1400-hp at 1000 rpm, Worthington's new W 9 engine has been designed for broad application. This includes service in utility and water works, sewage disposal plants, irrigation, chemical and petroleum, marine drives, mining, radio and radar stations, pump or blower drive, and mobile power applications.

Most modern feature of the new line is "Jet Swirl" turbocharged power. This is a streamlined design for air inlet which brings the air in parallel to the inlet valve stem and gives it a swirl as it enters the cylinder. This is designed to allow the ramming of larger, more turbulent air charges into the cylinder giving cleaner and more complete combustion.

Designed throughout for high pressure turbocharging, the W 9 is a new idea in moderate speed, high-performance engines capable of outputs up to 1400 hp at 1000 rpm, according to W. E. Wechter, Manager of Worthington's Engine Sales Division. The entire engine is structurally designed for operation at higher than 200 psi, bmep.

Welded steel construction of the W 9 affords a low weight per horsepower ratio thus providing lower building, foundation and installation costs. The new line is said to operate on lowest cost fuels—residual, crude, and distillate oils, natural, sewage, propane or manufactured gas.

Designed for the perfect, medium sized power package at permanent installations, the new engines are also adaptable for portable and semi-portable services such as temporary power for oil field services or on trailer or rail car mountings. The engine may be arranged as a drive unit from either end, and may be equipped with any of the standard clutches, hydraulic couplings, torque converters or other power take-off equipment.



service section

Recent engine and equipment modifications, procedures and recommendations straight from the different manufacturers to you

GM—Paper Fuel Filter Elements—Series 51, 71 & 110 Engines . . .

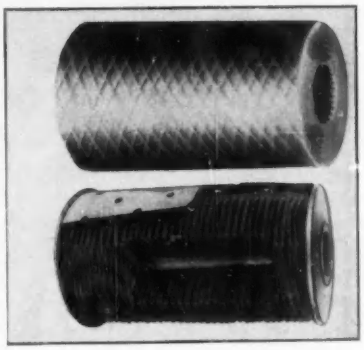
The fuel injectors of GM diesel engines are protected in three ways. A fuel strainer between the fuel supply tanks and the fuel pump removes any coarse foreign particles which may be in the fuel. Then a fuel filter between the fuel pump and the fuel injectors removes the more minute foreign particles. As a further precaution the internal working parts of the injector are protected by the filter elements installed in the injector body itself.

Paper fuel filter elements are currently being supplied in place of the former woven cotton yarn filter elements for field servicing of Series "51," "71" and "110" engine units. Paper fuel filter elements will also be incorporated into most production engine units in the near future. The two types of filter elements are depicted in the accompanying illustration.

Replaceable cotton yarn elements will continue to be used in the fuel strainer assembly.

Although cotton filter elements provide excellent protection, experience indicates that paper elements are more uniform in construction and more efficient, particularly in extracting any water that may be present in the fuel. Paper fuel filter elements remove approximately 14% more water from the fuel than cotton yarn elements under identical operating conditions. In addition, the large surface area provided by the compact paper element has eight to ten times the dirt storage capacity of cotton yarn elements of comparable physical dimensions.

It is the job of the element in the fuel filter to retain any harmful foreign articles that may pass through the fuel strainer and to



further filter the fuel before it reaches the injectors. Therefore, both assemblies must be serviced periodically in order that clean fuel will be supplied to the injectors. Adherence to a regular schedule for maintenance and changing of the filter and strainer elements at five hundred hour intervals of operation (or oftener under adverse conditions) is of paramount importance.

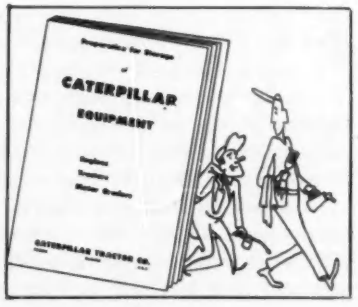
Caterpillar—Storage of Equipment . . .

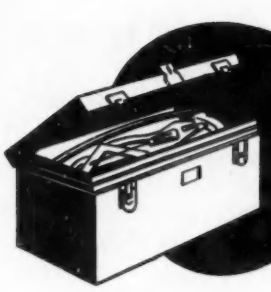
As cold weather approaches, many faithful machines that have put in a season of honest work will be "parked" for the winter. Some of these will be driven to their usual parking places, not to be used or thought of until the new work season begins. Others, whose owners are mindful of machinery deterioration caused by the elements, will benefit from scheduled preventive measures. Preservative measures, if properly performed will give full protection from extremes of dampness and cold during the time a machine is stored.

We now have a booklet which was prepared to help you fight the expensive damage which can be caused to a stored machine if unprotected from the elements. This booklet, entitled "Preparation for Storage of Caterpillar Equipment", is written in five sections and is offered to those who would like a copy.

The five sections completely cover the storage preparation procedures for engines, track-type tractors, wheel tractors, motor graders, tires, and electric generators. In addition a list of the required materials is included, as well as the recommended methods for applying the materials.

The means for complete protection from corrosion and other moisture damage is described in the booklet. Be ready for action at the start of the new season by following its directions and avoiding costly repairs.





Straight from the Tool Box

This is YOUR Department. Pass along your ideas to the other fellow. Send items to the Editor, preferably with a picture or sketch. Contributors will receive $10.00 for each item upon publication.

Cooling Irrigation Engines

E. A. Braker, Melrose Park, Ill.—I'm sure that the saving of money while getting more out of an engine in certain type installations is of interest to your readers. For this reason I'd like to bring to your attention how several diesel engine pumping units for irrigation have been installed. The picture shows one such unit.

A model U-501 International Harvester LPG burning engine rated 120 hp at 2100 rpm is shown driving a deep-well pump for irrigation. Note that the engine has no radiator or fan.

The accompanying diagram shows how an ordinary piece of pipe leads from the bottom of the jacket water surge tank and connects to several more pieces of pipe.

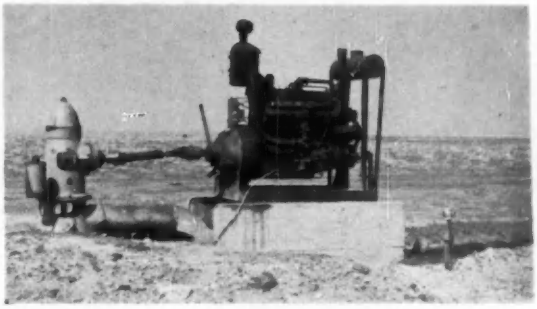
These short lengths of pipe are placed so that the cold water from the irrigation pump discharge flume runs over them. A return pipe then leads back to the engine jacket water pump inlet. Jacket water running through this pipe is cooled by the irrigation water and recirculated through the engine. In some installations an ordinary barrel placed on the ground has been used in place of the surge tank shown in the picture.

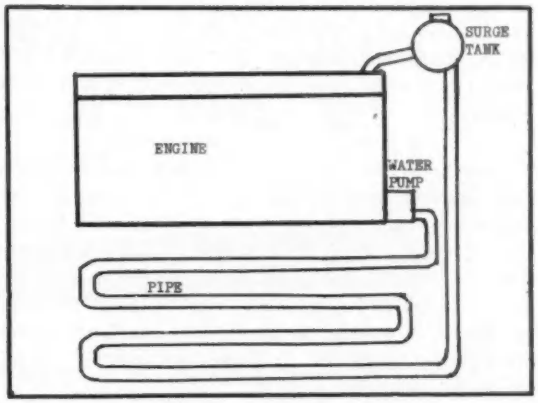
If pipe of adequate size is used to reduce water circulation friction loss to a minimum, this arrangement makes an excellent closed cooling system.

When the flume is close to the engine it is common practice to use 1½-in black iron pipe for engines to 50 continuous horsepower, 2-in pipe for 50 to 100 hp and 2½-in pipe for engines such as the International UD-1091.

Thin wall tubing and copper tubing are also in common use and can generally be of smaller diameter because of their greater area for water flow. The length of pipe used in the flume depends on the temperature of water used for irrigation and may vary from ¼ ft to 1 ft per horsepower. For this particular 120-hp, U-501 installation, 28 ft of 1¼-in pipe was used. This averages a little less than ¼ ft per horsepower of the engine.

Elimination of fan and radiator results in higher output at the flywheel since the power generally used to run the fan is now available. Also elimination of these parts results in lower initial cost of the engine.





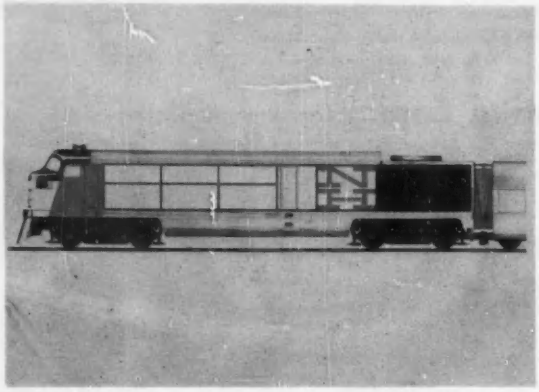
We go along with Mr. Braker in that this method is simple, practical and inexpensive. Actually it can be applied to almost any unit pumping cold water. However, watch the pipe length and diameter. Insufficient pipe gives high engine water temperature. Too much, or too small-diameter pipe overloads engine water pump. Editor

Installing Sealing Rings

Walter A. Fredericks, Lacon, Ill.—I have heard many complaints about how hard it is to put rubber rings on a liner. I've found that coating not only rubber rings but rubber seals and water hose with soap makes them easier to install. And the soap is not harmful.

These rings must not be twisted during assembly or they are very likely to leak. To prevent any possibility of twist, slip your finger or a pencil behind the rings and slide them out of the liner grooves. Run your finger or pencil around the inside of the rings two or three times then permit the rings to slide back in place without a twist.

news of our industry



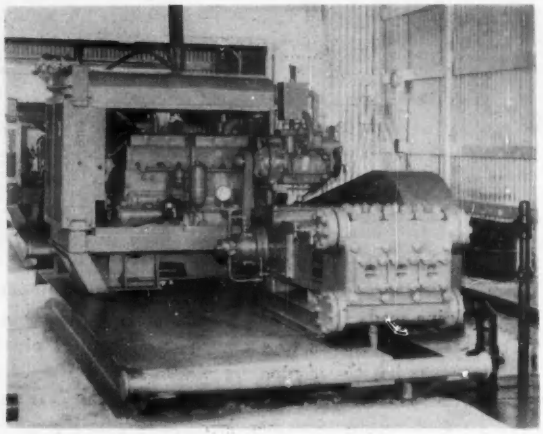
To Power New Haven's Talgo

Fairbanks-Morse has released an artist's conception of its new "Speed Merchant" locomotive. Capable of up to 115-mph speeds, a pair of these will power the new lightweight Talgo-type passenger train being built by ACF Industries for the New Haven Railroad's New York to Boston run.

To meet a New York City ordinance which requires that all trains entering Grand Central Station be electrically operated, the Speed Merchant will be able to function either as a diesel-electric or straight-electric locomotive. This will make it the first time that a diesel-electric mainline will roll into the station without an electric helper. It will derive its power from the 600-v DC third rail when it approaches the station, the combination drive achieved by installing supplementary electric control equipment and switch gear.

Designed to operate in either direction, the train will have no front or rear. A locomotive will be at each end, both controllable from either cab and each furnishing its power whatever the travel direction. Tractive power will be from a standard 8-cyl O-P of 1720 hp, which will also be used to power all locomotive auxiliaries and all train service functions including lighting, heating, air conditioning, and food service. Of the combined 3440 hp, a minimum of 2400 hp will always be available for traction, for a power-weight ratio of about 6 hp per ton of train.

Each unit is approximately 57-ft long, 10-ft wide, 12-ft high, and weighs about 200,000 lb. Mounting will be on two 4-wheel trucks each, with one truck powered and the other an idler. As a time saver, the coupling system will have all the necessary connectors to train-line both locomotive functions and train servicing power. A WAB Co. No. 26 air brake system will be utilized together with composition-type brakes shoes, another factor in reducing total locomotive weight.



High-Pressure Water Injection Duty

This skid-mounted unit is being used by Tide Water Associated Oil Co. to pump extremely salty water near New Hope, Texas. It consists of a Buda Model 6M0970 spark ignition natural gas engine turning at 1400 rpm to produce 188 continuous hp for a National Supply Triplex F-90 pump. Linkage is by means of 12-C-180 V-belts.

The pump runs at 200 rpm to discharge about 700-bpd of water into the Pittsburgh sand, 7800-ft deep, at a 4400-psi pressure. Occasionally this pressure goes as high as 4750 psi. The portable mounting was arranged to facilitate moving to another location if necessary.

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Three New Faces at DEMA

At the annual meeting of the Diesel Engine Manufacturers Assn., Thomas E. Hughes, Cleveland Diesel Engine Div., General Motors Corp., was elected to serve his second term as president.

Other officials returned to office were Wm. E. Butts, General Metals Corp.—vice president; Walter A. Rentschler, Baldwin-Lima-Hamilton Corp.—vice president; Robert H. Morse, Jr., Fairbanks, Morse & Co.—treasurer; and Harvey T. Hill—executive director and secretary.

T. E. Hughes
President

L. F. Williams
Director

W. F. Burrows
Director

J. N. MacKendrick
Director

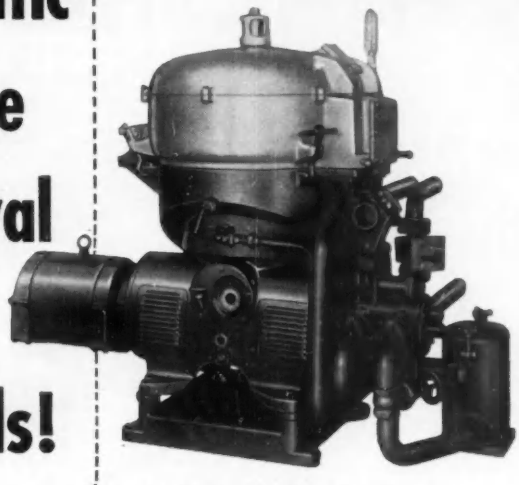
Together with the foregoing, the following will serve as directors of the association: Wm. F. Burrows, White Diesel Engine Div., White Motor Co.; Guy J. Coffey, Chicago Pneumatic Tool Co.; M. C. Davison, Ingersoll-Rand Co.; Otto H. Fischer, Union Diesel Engine Co.; Robert E. Friend, Nordberg Mfg. Co.; John N. MacKendrick, Clark Bros. Co.; E. J. Schwanhausser, Worthington Corp.; Lawrence F. Williams, Cooper-Bessemer Corp.; and Gordon Lefebvre, Dresser Industries.

Honorary chairman will be George W. Codrington, and honorary vice chairman, A. W. McKinney of National Supply Co.

The three men pictured with Mr. Hughes are new members of the association.

Automatic sludge removal in seconds!

WESTFALIA SEPARATOR



Westfalia Model SAOG-4016 Marine Type De-Sludger (self cleaning oil separator) with hinged, vapor-tight hood, equipped with built-on double gear pump, strainer, flow indicator, inspection-sample station.

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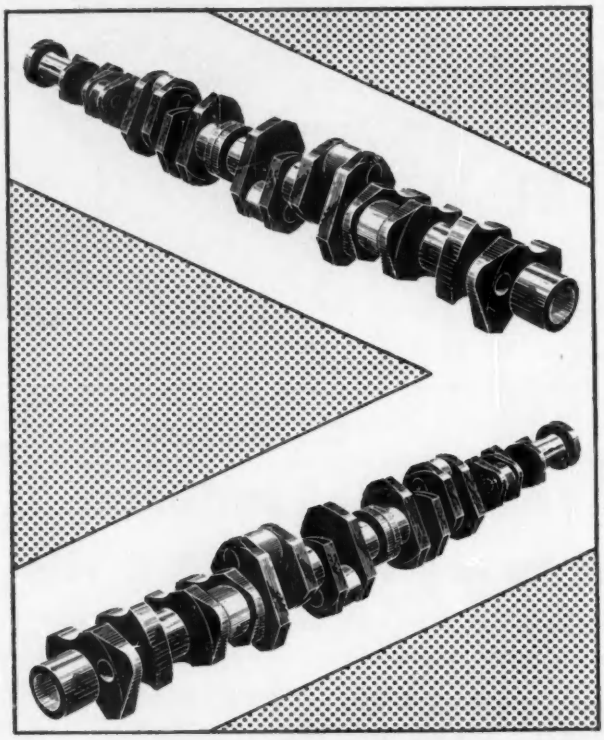

Chromium Plated

by

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OLEAN, NEW YORK TERRELL, TEXAS

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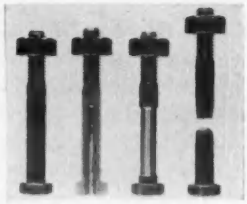


Increasing Bolt Strength

A method for increasing the strength of bolted joints, when subjected to shock loads, was presented to the annual meeting of the American Soc. of Mechanical Engineers by O. A. Pringle, assistant professor at the University of Missouri, prepared with John Love, Jr., a former assistant professor at the college, now with General Electric.

The method involves removal of a precise amount of material from the bolt's shank, reducing the shank to certain optimum sizes depending on its type, method of manufacture, and heat treatment. Although the bolt will weigh less, its capacity to absorb impact energy will be several times greater. Prof. Pringle said this will prove valuable in engine construction and in machinery subject to sudden and repeated shock loads.

Another feature of the modified bolt is that it permits greater stretching or elongation during tightening. This will result in the nut being less likely to loosen because of vibration, and also increase the bolt's resistance to fatigue failure, the professor declared.

A close-up view of four bolts demonstrates the achievement. Looking from left to right, the first is an ordinary machine bolt. The second shows a cutaway view of an ordinary bolt with the optimum amount of metal drilled from the shank center. This is said to produce the same strengthening effect as the third bolt which has had the optimum amount of metal taken from the outside of the shank. The last bolt demonstrates the effect of removing more than the optimum amount of metal from the center of the bolt shank. It resulted in this stretching or elongation when more than the maximum impact was applied.

news of our industry

Patent Held Up? Here's Why

American industry is facing long delays in obtaining patent coverage for products and processes ready for the market, according to reports made at the fall meeting of the New York Patent Law Assn. These delays stem from the great increase in patent applications filed during past years, which flood has stretched average prosecution time per patent to 3½ yr. The only way to reduce this is to employ more patent examiners to pass upon the backlog, it was pointed out.

Steps already taken in this direction are the addition of over 100 new examiners, with plans to build this number to 350. There are immediate openings. Salaries start at $4345 yearly, reaching $7570 in 5½ yr. Engineers and scientists holding a college degree in engineering or applied science, or one with a major in chemistry or physics, or with certain combined credits in these fields are eligible for appointment without examination upon application to the commissioner of patents in Washington.

Diesel Sets Air Condition RR

Caterpillar Tractor Co. announces that is has begun delivery of 53 self-regulated generating sets to the Santa Fe Railroad. The 35 D315 and 18 D318 sets will be used to air condition new passenger cars. Budd Co. will engineer the installation.

New Census of Manufactures

The U. S. Bureau of Census an nounces that final tabulation of th results of the 1954 Census of Manu factures is underway and advance reports are being made available. Final reports will be coming out early in 1956, with the middle of the year the target for completion of the job.

The last previous census covering manufacture was for 1947. This new census will comprise 450 industries and will include information on water usage and horsepower rating of equipment for the first time. There will also be greater detail on products shipped, materials used, and more plant specialization statistics.

Better Wheel-to-Rail Adhesion

Longer freight trains are now predictable following discovery of a method for giving locomotives a better grip on rails. Results of investigations for solving the problem of low wheel-to-rail adhesion, which were conducted by the Reading Railroad and General Electric Co., were reported at the annual meeting of the American Soc. of Mechanical Engineers.

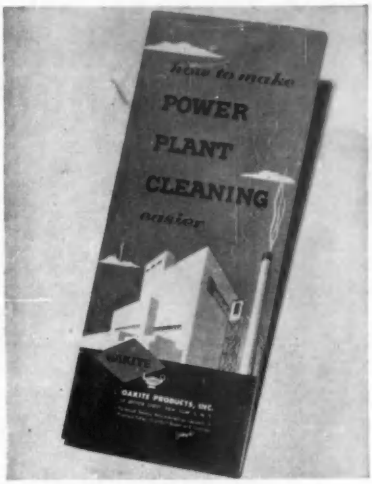
Best method was found to be chemical conditioning of the rails to remove an invisible oil film which originates from wheel bearings and is spread by moisture. Adhesion achievement was said to be greater than that of a well sanded dry rail.

Wheel slippage is a limiting factor in pulling heavy loads, particularly on grades and in adverse weather. It's also a major cause of damage to equipment, such as burnt rails and flat wheels, and the cause of train delays, use of additional locomotive units, and extra crews for pusher service.

Oil film has been removed by two test methods: detergent cleaning and chemical conditioners. The first is limited to clear weather use and costs are said to be prohibitive. Various conditioners were compared and the best have been selected for further testing. Field tests have proven their advantage, but the limits of adhesion possible with these conditioners have so far not been established.

New Enterprise Service Branch

Shown here is a portion of the well-equipped warehouse recently opened by Enterprise Engine & Machinery Co. at Long Island City, N. Y. The facility offers factory-trained service engineers, repair parts, tools and equipment on a 24-hour-day notice. Stationary and marine diesels are handled, in a territory which extends east to New Haven, Conn. and south to Virginia.



SAVE MONEY ON DIESEL UPKEEP

free booklet tells how . . .

THIS illustrated booklet contains a wealth of sound, practical ideas to expedite Diesel maintenance, keep operating costs low and extend equipment life. Gives details on such subjects as:

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- Descaling jacket water coolers
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- Steam-detergent cleaning
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Booklet also discusses tested Oakite procedures for streamlining maintenance in steam control stations and electric power plants.

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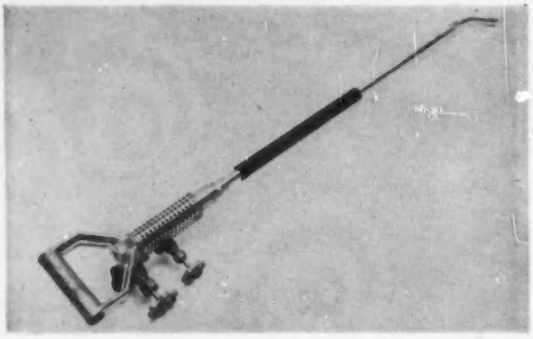


Steam-Cleaning Gun

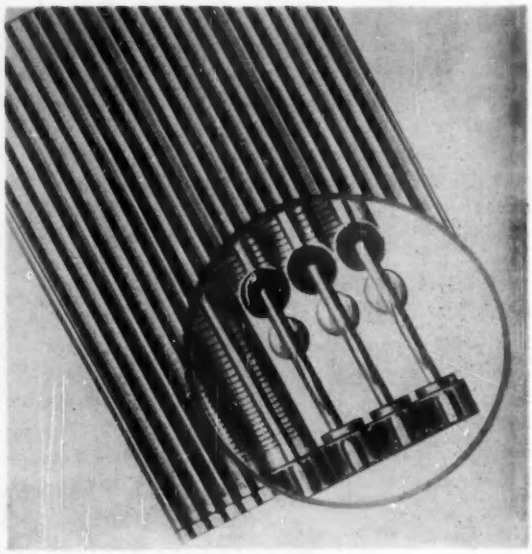
Cooler and easier handling are the special features Oakite claims for this newly designed Hurriclean gun. It uses a tube within a tube—steam passes through the insulated interior tube, solution through the exterior—to protect operator from the heat of the steam.

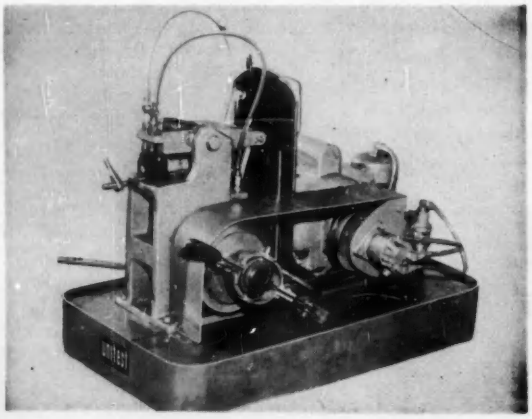
A sealed rotary joint makes it possible to rotate the nozzle while the handle and hose connections remain stationary. Operator fatigue is further reduced by the thrust of the steam being taken up between the handles. In its 3½-ft length, the gun weighs 6¾ lb, slightly more in the 5-ft size.

Storage Battery Development

Polyethylene, a versatile plastic material, is now a vital part of the batteries made by Electric Storage Battery Co.'s Exide Div. Exide has found that its use for its finely slotted tubing and tube sealers, which encase the active material and grid spines of the positive plates of the batteries, lengthens battery life and makes it possible to increase capacity.

The company expects up to 20% increase in starting battery working life. In service life tests, the new tube cells were able to deliver up to 82% of capacity compared to rubber tube cells' 42% and competitive flat plate cells' 12%. Also, no batteries with the polyethylene tubing failed prematurely for causes attributable even in part to the tubing. The fine slots in the tube construction are said to keep the active material in contact with the grid spines and permit it to be freely penetrated by the electrolyte. The tube sealers attached to the bottom of the tubes function to firmly seal in the active material and prevent short circuits.





Diesel Fuel System Tester

Originally developed by Diesel Control Corp. for its own use in servicing injectors and pumps, this Unitest Model U-8000 Calibrating Fixture is now available to fleet operators of GM Series 71 engines. It is electric motor driven, with a clutch throwout of the camshaft drive. A locking lever positions the injector to be calibrated and run-in, and automatically connects the "fuel-in" and overflow lines.

Fuel stored in the base, passes through both a strainer and final stage filter between the primary pump that is directly connected to the motor and the injector. All moving parts are standard GM Series 71. The calibrating mechanism consists of a standard graduate glass and a timer for continuous identical calibrating runs.

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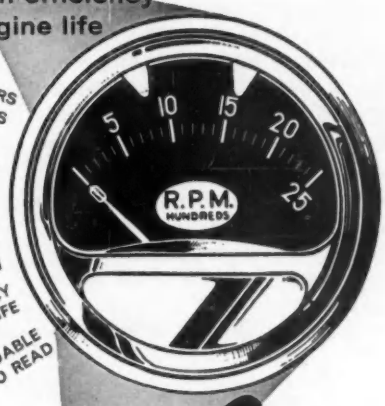

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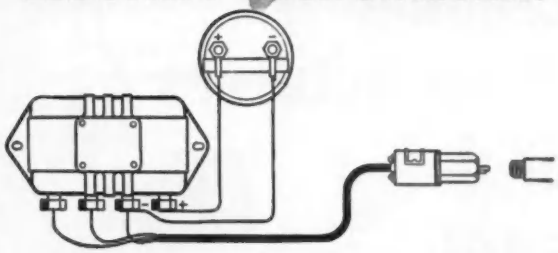

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new products

Heavy-Duty Mobile Workbench

Portability of many shop tools such as small drill presses, bench grinders, and the like may be achieved by utilizing a mobile workbench newly developed by Overbeke-Kain Co. The unit consists of a cabinet, three shelves, a drawer, and two doors that can be locked shut.

To facilitate electrical tool use, an extension cord and plug-in connection is available. Of all-steel and designed for hard continuous service, the unit is capable of supporting a ton safely. Position is held by a foot-operated locking mechanism. A standard unit is 34-in high, 41-in long, 26-in wide, and table top is 24 in by 36 in.

Wire Rope Straightener

On the market now is a portable machine which removes bends, twists, loops, and kinks from all sizes of cable. Length of cable and eyes are said to be no problem in the straightening operation. It's available from Cable Strate Co.

The World's Leading Manufacturers of FUEL INJECTION EQUIPMENT for Diesel Engines

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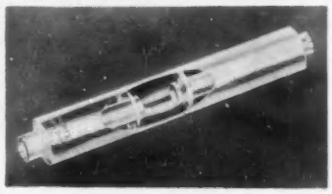
C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES INC., 653, TENTH AVENUE, NEW YORK, 36, N.Y.
Sales Office: 14820 DETROIT AVENUE, CLEVELAND, 7, OHIO.

AP174-754



Heavy-Duty Truck Mufflers

Minimum back pressure, rugged construction, superior silencing, and better fit are the claimed features of a new line of mufflers for the replacement market, produced by Harflo Products. Called Sone King, they are of the stack-type and have an "interrupted through" design which is said to provide tone control well below that specified by the SAE.

The mufflers are constructed of 16 gauge steel throughout, the long seam continuously welded; and head, baffles and tubes electric arc welded. Finish is a dapple gray enamel. Four universal models are available, one of the four said to fit three out of five diesels without adapters. In other cases, a simple extension or reducer is needed. To emphasize how thoroughly it has researched the fitting problem, Harflo points out that just two extensions and reducers are included in the line.

Power Jack for Engineer Corps

A self-propelled hydraulic power jack has been developed by the Corps of Engineers' research and development laboratories, Ft. Belvoir, Va., and the Kershaw Mfg. Co., Montgomery, Ala., to speed up surfacing of railroad tracks. Propelled by a hydraulic motor with 2-speed transmission, the unit has a 3-mph working speed and can travel up to 12 mph.

It has rail "dogs" which operate automatically on any size track as the foot is lowered between ties. One man can operate the unit, which is equipped with a turntable to permit removal from tracks in less than 2 min. It is one of several items under development and test by the service to accelerate construction and repair of military railroads. Others are a maintenance car, track shifter, ballast tamper, rail cutter, and hydraulic rail bender.

new products

Mechanical Sound Detector

The smallest internal defects in moving machinery can be detected, without shutting down or taking the equipment out of service, with its new listening device, Burke & Co. states. Named the Engineer's Sound Detector, it resembles a stethoscope and utilizes dual detectors to transmit sounds to one or both ears as desired.

When used on an internal combustion engine, the company claims, it enables the user to diagnose sounds caused by scored cylinders, bent shafts, worn bearings, excessive end play, or lack of lubrication. A pair of extension rods are furnished for reaching into remote places and an interchangeable bell stethoscope is supplied to detect pressure or vacuum leaks.

Heavy-Duty Motor Grader

Allis-Chalmers has added this Forty-Five motor grader to its line of heavy-duty units. It weighs 23,800 lb, two-thirds of which are on the tandem drive rear wheels. Blade pressure is 10,950 lb.

The company's new ADS-516, 6-cyl, 4-cycle diesel engine furnishes the motive power with its rated 120 maximum bhp at 1600 rpm. It has a 4 7/16-in bore, 5 9/16-in stroke, and a 516-cu in displacement. Power is delivered up to 20.6 mph for forward speeds and up to 7 mph in reverse. The grader can be throttled down, under governor control, to one-half these rated speeds without loss of rim pull.

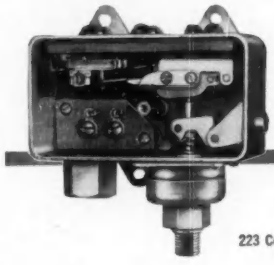
A basic design feature of the machine is a finger-tip control box with toggle-type linkage to give increased leverage for moldboard, wheel lean, and scarifier operation. Other features include combination mechanical-hydraulic power steering, self-energizing brakes, accelerator-decelerator pedal for changing engine speed without change of hand-throttle setting, a double-disc master clutch, and double universal joint drive shaft to provide self-alignment between engine and transmission. It has a 24-v starting system.

Aluminum Welding Cable

Tweco Products Co. has developed a lightweight aluminum welding cable it calls Tweco-Lite which is said to weigh only one-half as much as conventional copper welding cables. It is made in Grade SR, which has a synthetic rubber jacket, and Grade N-60, which has a 60% neoprene jacket reinforced with rayon braid.

The first grade is recommended for normal use, the second where oil, heat, chemicals, abrasion, and rough usage are encountered. Both are made in No. 4 through 4/0 sizes. Prices are said to average about 20% less than copper cables.

COMPACT DETROIT CONTROL PROTECTS YOUR DIESEL



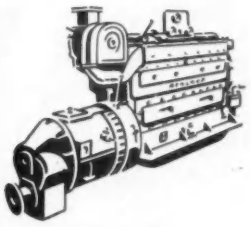
223 Control, cover removed

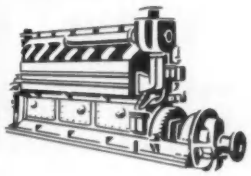
Detroit 223 Control has wide application in lube oil pressure and temperature alarm systems. It is also used as an automatic engine control switch for emergency shutdown and in other critical functions. This rugged control is only 4 1⅜" x 4⅜" x 2¾" and weighs 2½ pounds. The 223 Control is water tight and not affected by conditions of high temperature and high humidity.

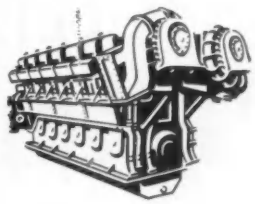
This automatic switch is actuated by either pressure or temperature. It can control several circuits, it can actuate a program of safety circuits or it can govern one circuit alone.

Marine, locomotive and stationary diesel engines, pumps, oil drilling engines, mobile compressors and dynamos are only a few applications where Detroit 223 Control safeguards valuable engines and machinery.

Bulletin 257 will be forwarded at your request.







Detroit Controls supplies a wide variety of dependable automatic controls for industry.

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CORPORATION

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new literature

Swaged Hose Assemblies
of the Weatherhead Co. including hose, hose end, and adapters are covered in catalog S-1 from that company. A simple, detailed hose assembly numbering system is featured.

Plate Coil Data
and prices are included in a 4-page bulletin from the Thermo-Panel Div. of Dean Products, Inc. The product described substitutes for pipe coils in heating and cooling, and consists of two metal plates welded together to form flow channels.

Mobile AC Generators
small enough to be mounted under the hood of a car or truck are described in an 8-page brochure from Star-Kimble Motor. The new units, described in Sept. 1955, DIESEL POWER, make a 110/120-v outlet available wherever your truck goes.

Power Transmission Problems
solved by its couplings are presented in case history form by American Flexible Coupling Co. in a new booklet.

Temperature Controls
of the differential expansion type are covered in a condensed catalog of Burling Instrument Co. The entire line of instruments, suitable for high temperature safety alarms and cutouts, is pictured and an instrument selection chart is included.

Air Tool Lubricators
in sizes for use with the smallest hand-held units to the largest quarry-type drills are described in a bulletin from Ingersoll-Rand Co. Pictures illustrate damage to various parts by improper lubrication. A table is included to help the user select the right lubricator size for his tools.

Rotary Gear Pumps
tradenamed Hydrex, for continuous and intermittent service, are the concern of the latest release from Sier-Bath Gear & Pump Co. The pumps range from 32 to 250,000 SSU, 1 to 350 gpm.

Fuel Oil Conditioning
a new service of Sumco Engineering Co. for reducing fuel consumption and maintenance costs, is detailed in a descriptive catalog from the company.

Special Service Tools
for GMC diesel and gasoline trucks are completely detailed in a 48-page manual offered by Kent-Moore Organization, Inc. Model application is specified for each tool.

Heavy Oil Operation
of M-A-N diesel engines for marine application is detailed in the latest literature from that company. The complete listing of ocean vessels with heavy-fuel equipment is included.

Here's Why

PERFORMANCE IS BETTER WITH Bendix STARTER DRIVES

CHECK and COMPARE THESE FEATURES
• Starting motor can be mounted more easily and in more positions.
• Requires no actuating linkage—solenoid can be placed in any convenient position.
• Simple in design—has fewer parts—needs fewer adjustments.

It takes a truly outstanding product to receive over 100,000,000 endorsements. Yet, that's the number of Bendix Drives that have been installed. No other starter drive approaches this record of outstanding performance. That is why, whatever your type of diesel or whatever its purpose, it will pay you to specify Bendix* Starter Drive for the most economical installation and dependable performance. *REG. U.S. PAT. OFF.

ECLIPSE MACHINE DIVISION of Bendix AVIATION CORPORATION
ELMIRA, NEW YORK
Export Sales: Bendix International Division, 205 E. 42nd St., New York 17, N. Y.

new literature

Dry-Type Fluid Coolers
using ambient air for heat transfer are described in a new bulletin from The Trane Co. Their applications include engine jacket water and engine oil cooling, and gas compressor inter- and after-cooling.

Pressure Gauge Uses
of the switch model type produced by W. C. Dillon & Co., Inc. are presented in an engineering brochure. Details of the switch arrangement and ratings are given along with dimensions and latest price schedules.

Elapsed Time Indicators
available for operation on 115-v, 60-cycle AC are described in a product engineering bulletin, issue of Haydon Mfg. Co. Complete specifications of the running time meters, which indicate and repeat hours of operation up to 10,000 on a dial-type face, are given.

Protection for Fuel Oils
in storage with its Fuelguard additive is described by Carlisle Chemical Works, Inc. in a colorful brochure. Full range benefits claimed include sludge, haze, color, pitting, and rust control.

What is a Forging?
An 8-page booklet by that title gives a full explanation in simple language, illustrated with pictures and drawings. Drop Forging Assn. is making it available.

Motive-Power Battery Users
are offered a 48-page maintenance and service manual on lead acid batteries. Industrial cycle service in its entirety is covered, including marine service, mine locomotives, and railroad diesel starting. Instructions cover repairs with regular or special tools, and simplified testing methods include safety practices, acid handling precautions, and instruction on correct charging methods. It's available from C & D Batteries, Inc.

Chain and Drive Wheels
built by Beaumont Birch Co. for bucket elevators and conveyors, are given basic review in its newest literature.

For Final Finishing Metals
Complex Tools & Abrasives has issued a product bulletin describing methods of application for its abrasives and chemicals. A price list is included.

Non-Destructive Testing
with a new portable gamma ray projector is described in a 24-page booklet released by Metal & Thermit Corp., which has joined with M. W. Kellogg Co. in offering the services of radiography to industry.

Vibration Measurement
is covered in a 64-page booklet issued by General Radio Co. Meaning of vibration terms, description of measuring instruments, procedures, typical examples, and interpretation of results are some of the contents.

organizational news

Elected General Sales Manager
at Tuthill Pump Co., A. L. Caney switches from district representative at Diamond Chain Co.

Vice President
and general sales manager is now the official title of Robert F. Lay at Cooper-Bessemer Corp. He assumes the elective post from a position as sales manager which he advanced to the first of this year.

A. L. Caney

R. F. Lay

H. J. Barbour

R. E. Hunter

Now Manager of Advertising
and public relations at Fairbanks, Morse & Co., Henry J. Barbour has a total of 31 years of association with the company. He succeeds L. A. Harlow who resigned.

Named General Sales Manager
at Detroit Diesel Div. of GM, Robert E. Hunter, transfers from General Motors Diesel Limited of Canada where he was director of sales.

New Face at American Bosch
is that of Richard S. Jay, just appointed assistant to the vice president of sales. He retires from a sales managership at Gar Wood to take the post.

Latest Addition
at Nickel Cadmium Battery Corp. is Gordon R. Howe, appointed manager of the firm's new San Francisco office. He was lastly in engineering sales for Minnesota Mining & Mfg. Co.

R. S. Jay

G. R. Howe

MODEL GA-3

Synchro-Start MODEL GA-3 speed sensitive switches are suitable for installation on AND20005 aircraft tachometer drive pad.

These units are adjustable while running, splash proof, and have a flexible drive shaft to compensate for mounting misalignment. They can be supplied to open or close 3 separate circuits at any speeds between 1200 and 10,000 RPM.

DIMENSIONS — 2⅝" Diameter x 6" Long — Weight 1¾ lbs.

Other governors with 1 and 2 switches are available with a variation of mountings for tachometer cable and SAE coupling drives.

SYNCHRO-START PRODUCTS
INCORPORATED
8151 N. RIDGEWAY AVENUE, SKOKIE, ILLINOIS

CALL Your Nearest Representative for
VIKING PUMP
SALES and SERVICE

VIKING PUMP CO.
CEDAR FALLS, IOWA, U.S.A.

In Canada it's "ROTO-KING" Pumps
SEE OUR CATALOG IN SWEETS

ALABAMA
Birmingham 5, Pump Shop, Inc. 1015 7th Ave. South Phone 3-3206

CALIFORNIA
Los Angeles 58, (S) E. F. Burton 4422 Long Beach Ave. Phone ADams 3-8165
Millbrae (S) (Also Seattle and Portland) DeLaval Pacific Co. 201 East Millbrae Ave Phone OXford 7-4001

COLORADO
Denver 16, (S) (Also Albuquerque, Casper, Billings, and Omaha) Eaton Metal Products Co. 4800 York St. Phone TAbor 5-7205
Denver 17, (S) Hendrie Bolthoff Co. 1635 17th St. Phone KEystone 4-4111

GEORGIA
Atlanta (S) C. W. Downing 1214 Spring St. N.W. Phone VErnon 9065

IDAHO
Boise Gate City Steel 4000 Warm Springs Ave. Phone 6377

ILLINOIS
Chicago 4, (S) C. W. Dennis 549 W. Washington Blvd. Phone STate 2-6818

INDIANA
Evansville 8, Shouse-Brill Machinery Co. 202 Court Building Phone 5-2601
Indianapolis 25, (S) C. D. Sadler 4?? Madison Ave Phone MElrose 5-0349
Indianapolis 25, (S) Indiana Oil Corp. Co., Inc 417 Madison Avenue Phone MElrose 5-9767

KANSAS
Overland Park (Kansas City) F. J. Pinney 7712 W. 79th Street Phone Niagara 6023

KENTUCKY
Louisville, (S) Neill LaVielle Sup. Co. 2211 So. Brook St. Phone CAlhoun 5401

LOUISIANA
New Orleans 12, (S) Menge Pump & Mach. Co. 549 Dryades St Phone CAnal 4851

MARYLAND
Baltimore, (S) Walter H. Eagan Co. 237 President St. Phone LExington 9-1943

MASSACHUSETTS
Somerville 43, (S) Hayes Pump & Mach. Co. 100 Vine St. Phone MOnument 6-3800

MICHIGAN
Detroit 26, (S) Kerr Machinery Co. Kerr Building Phone WOodward 1-8598

MINNESOTA
Minneapolis 3, Reed Herr 111 East 16th St. Phone BRidgeport 7582

MISSOURI
St. Louis 1, Lane Machinery Co. 7th and Market St. Phone CEntral 1-0011

NEW MEXICO
Bobbs, (S) (Also Artesia) Union Supply Co., Inc. Phone 3-3183

NEW YORK
Buffalo 10, (S) Root, Neal & Co. 61 Peabody St. Phone FAirview 6400
New York 36, (S) Herbert Fuhrer 639 W. 44th St. Phone LOngacre 3-3816

NORTH CAROLINA
Charlotte, (S) Southern Pump & Tank Co. 1730 No. Tryon St. Phone 4-8671

OHIO
Cincinnati 2, (S) Wm. T. Johnston Co. 214 Vine St. Phone GArfield 6262
Cleveland 13, (S) J. A. Sinden 3118 Marshall Bldg. Phone CHerry 1-0687
Columbus 8, Tuller Corporation 947 W. Goodale Blvd. Phone ADams 3600
Dayton 2, The Wagner-Smith Co. 541 W. 2nd St. Phone ADams 7248

OKLAHOMA
Tulsa 8, (S) Miller Equipment Co. 2202 E. Admiral Blvd. Phone LUther 4-1491

PENNSYLVANIA
Philadelphia 30, (S) Walter H. Eagan Company 2336 38 Fairmount Ave. Phone STevensen 7-2300
Pittsburgh 22, Power Equipment Co. Oliver Building Phone ATlantic 8290

TENNESSEE
Memphis 3, (S) E. C. Blackstone Co. 600 Madison Ave. Phone 8-2191

TEXAS
Amarillo Wilborn Bros. Co. 101-13 Houston St. Phone 2-4311
Dallas 22, (S) O. W. Phillips 2175 W. Commerce P. O. Box 5823 Phone RAndolph 3638
El Paso (Also Phoenix, Ariz.) G. S. Thompson Co. 611 N. Campbell St. Phone 3-4471
Houston 1, (S) (Branches: Dallas, San Antonio, Edinburg, Kilgore and Beaumont) Southern Engine & Pump Co. 2401 McKinney Ave. Phone CApitol 2-9226
Odessa, (S) W. L. Semmen Co., Inc. P. O. Box 1426 Phone 6-5379

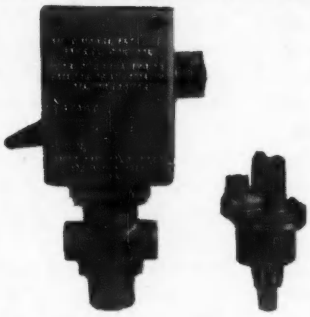
UTAH
Salt Lake City 1, Utility Engineers, Inc. 630 Dooly Bldg. Phone 3-4682

VIRGINIA
Richmond O'Neill Pump & Eng. Co. 601 E. Franklin St. Phone 7-4828

WISCONSIN
Marshfield, (S) Felker Bros. Mfg. Co. Phone 230
Milwaukee 3, C. F. Mullens 610 W. Michigan St. Phone BRoadway 6-0807

STOCK (S)

AMOT SAFETY CONTROL



AMOT Model 1476-47 automatically shuts down engine on high water temperature or low lube oil pressure. Features are:

1. **No capillary tube and bulb used.**
2. **Uses well known AMOT element.**
3. **Several temperature sensing units can be used with one control unit.**
4. **Will operate an air whistle.**
5. **Will operate a diaphragm gas valve for large gas engine shut down.**
6. **Will operate as a diesel fuel shut off valve.**
7. **Available with 2" direct connected gas valve.**

AMOT CONTROLS CORPORATION

RICHMOND 1, CALIFORNIA

KIENE® DIESEL PRESSURE INDICATOR

gives compression and firing pressures faster

SIMPLE RELIABLE COMPACT

Send for Bulletin K-100

The Model K-100 Kiene Pressure Indicator accurately measures compression and firing pressures — assures the proper maintenance of diesel engines — helps prevent costly down time. Only one moving part — no friction or inertia effects — no complicated adjustments.

KIENE DIESEL ACCESSORIES, INC.

10352 PACIFIC AVE., FRANKLIN PARK, ILLINOIS

organizational news

Gar Wood Advertising
and sales promotion is now being managed by Ralph W. Zahniser who has been with company since 1951.

Edward C. Magdeburger
eminent diesel engineer, is dead of a heart attack. Associated with the Navy's Bureau of Ships since 1922 until his retirement in 1953, he was instrumental in the Navy's adoption and use of diesel engines. He was honored last spring by the ASME for his contributions in the diesel field and was to be cited for honorary membership in the ASNE.

J. B. Laramy

A. F. Welsh

Worthington Appointments
have established John B. Laramy as assistant general sales manager and Alvin F. Welsh as manager of the marketing research department.

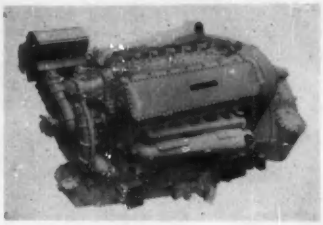
New Addition at C. Lee Cook
is Richard W. Hoyt, appointed assistant to the president. He was previously vice president and chief engineer at Double Seal Piston Ring Co.

Sales Staff Expansion
at Mack Trucks reflects the company's growth and diversification. New appointees are Lewis E. Minkel as vice president and sales manager, and Gerald F. Jones as vice president and executive administrator.

Posted as Assistant Manager
of the AiResearch Mfg. Div., Garrett Corp., Richard E. Palmer upgrades from contract administration manager. His former position has gone to James F. Gardiner.

H.O. Penn Executive
Stuart A. Wade, one of the owners of H. O. Penn Co., has passed away. He first became a member of the company in 1936 in a sales capacity and was instrumental in setting up and managing its Connecticut branch during the war. In 1946, Ralph L. Johnson, president, and he, as vice president and general manager, purchased the organization which has rapidly expanded since that time.

news of our industry



Napier Deltic Diesel

This pictured 18-cyl high-speed marine unit is claimed to be the lightest and most compact diesel for its power in the world. It was designed and developed for the Royal Navy of Britain, whose latest patrol boats and coastal minesweepers are fitted with these 2500-hp engines.

The man responsible for its development, Ernest E. Chatterton, chief engineer of Napier and Sons' piston engine division, made it the subject of a recent talk before the golden anniversary meeting of the Society of Automotive Engineers.

As detailed last month, the name of the engine, the Deltic, is derived from the configuration of its cylinders which are arranged in three banks resembling the Greek letter. In cross section they form an inverted equilateral triangle with a crankshaft at each apex. The opposed piston 2-cycle design permits a balance of the reciprocating forces to be obtained and is said to enable running which is virtually free of vibration.

The Deltic range takes in both marine and industrial. Advanced development phases are currently being undertaken, with a turbocharged version expected to be available soon. This will be followed by a compound type based upon the techniques proven in Napier's Nomad airplane engine which has a successful union of a diesel and gas turbine, utilizing the advantages of both.

In the railroad field, two 18-cyl Deltics are providing motive power for a new English Electric locomotive. Two of the engines together are developing 3300 hp for a total locomotive unit weight of 106 long tons.

Fairbanks Morse & Co. selected a Quincy Compressor to supply compressed air for starting this new apposed piston diesel. Like other leading diesel engine manufacturers, Fairbanks Morse used a Quincy because it gives long life and trouble-free service.

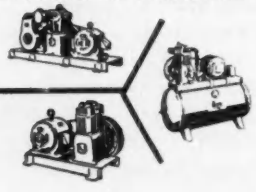
Specify a Quincy Compressor for your next diesel starting job. Compact, rugged Quincy Compressors will give you a dependable air supply.

There's a Quincy Compressor for every job. Let us help you select the right model from a variety of mountings and sizes from 1 to 90 C.F.M.

Write Dept. J-46, Quincy Compressor Co., Quincy, Illinois, for catalog on Quincy Compressors for diesel starting.

MAKERS OF THE WORLD'S FINEST AIR COMPRESSORS

QUINCY COMPRESSOR CO.
QUINCY, ILLINOIS



Diesels for NYC Sewage Plant

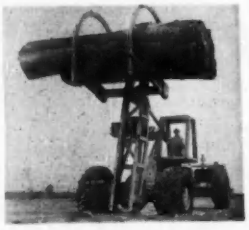
Enterprise Engine & Machinery Co. has delivered the first two of four trifuel diesel engines ordered by New York City for its Bowery Bay pollution control project. The enlarged plant will have a 120-mgd capacity against an original 40 mgd.

The new engines will run on sewage gas in normal operation, supplemented by diesel fuel as necessary. They will drive four 1250-kw General Electric generators, developing 1775 hp each at 360 rpm, and provide power for blowers and main sewage pumps. These Q-series engines are said to be especially adaptable to the varying fuel supply and fluctuating load conditions encountered in this service.

P&H License to Japanese

Harnischfeger Corp. has concluded a manufacturing arrangement with Kobe Steel Works, Ltd., Japan, for production in that country of P&H power shovels and truck cranes. The Kobe production will serve markets in the Far East, South East Asia, and the South Sea Islands.

news of our industry



Specialized Fork Lift

Converting logs to lumber for the building boom will be made easier soon with this formidable machine, its designer declares. It sports two 10-ft spears beneath mastodon tusks which are capable of loading 50,000 lb of logs. And Texas, which boasts of such overgrown achievements, was its birthplace. R. G. LeTourneau, Inc., the builder, calls it the Electric Log Stacker.

"Rube Goldberg" Farm Machine

Dubbed the "Wonsover", because that's probably the best way to describe it, is a 24-ft plowing, harrowing, soil-conditioning, seeding, fumigating, and fertilizing machine, which its inventor claims will do all these chores in 90% of the time ordinarily required. Herman Cohen, the inventor, and chairman of Norton Portland Corp., which is the designer, has sold the first production unit to W. R. Grace & Co. for plantation work in Peru.

Price of the machine is estimated to be something above $20,000, fully equipped. Mr. Cohen says conventional equipment to do comparable work would be about $125,000. Todd Shipyards Corp. has been contracted to construct the machine, and officials say they soon expect to be producing five a day. Caterpillar Tractor, which supplies the diesel engine, has been named distributor.

In tests on his 300-acre farm in Maine, Mr. Cohen said the machine planted an acre of corn in 20 min, a job he estimates would take the average farmer three 10-hr days, including plowing, harrowing, and soil preparation.

The machine looks like a wheel-type landing craft used during the war. Its diesel is used only to operate the various tools, not as motive power. It must be drawn behind a tractor, or behind a harvester if planting is wanted immediately following harvest. It has a portable control panel which can be connected to the towing vehicle and operated by the driver.

At the front of the machine are two bins, one for lime or fertilizer or both, the other for weed-killing or pest-killing chemicals. Flicking a switch does the spreading. A chamber behind the bins holds a series of hammers which toss and mix the fertilized soil to 10-in deep. These take the place of a plow and harrows to prepare the soil.

The soil is leveled by a revolving blade device, and then a sub-soiler digs the earth to permit moisture circulation. Seeding is next accomplished from a seed bay behind the sub-soiler. Another fertilizer can be applied if required. Near the rear of the machine eight tires pack the soil, the notched pattern left by their tread designed to prevent erosion and retain rain water. The final device applies a surface spray to kill unwanted plants or wind-blown weed seeds. All the above is accomplished at a speed of 5 to 15 mph.

To top it all off, the exhaust pipe of the diesel curves back to the two front bins to recover sulfur and nitrogen from the engine exhaust and mix it with the fertilizer and pest-killers.

Set New World Engine Congress

The permanent committee of the International Internal Combustion Engine Congress has established Zurich, Switzerland as the site of its next gathering. Since the inception of the international group, three meetings have taken place: Paris in 1951, Milan in 1953, and The Hague in 1955.

Theme of the 1957 event will be the supercharging of diesel engines and gas turbines for marine, traction, and large-size generating equipment. Those desiring to present papers are advised to contact their national committee or the permanent committee before February 15.

THE MOST POWERFUL TWIN SCREW DIESEL EVER BUILT FOR INLAND WATERWAYS . . IS BRIGGS EQUIPPED

. . . . BIG JOBS . . . like A. D. Haynes II . . . the gigantic USS Forrestal . . . the huge, powerful USS Glacier are but a few of the vast number of Briggs equipped marine installations.

WHERE DEPENDABILITY is required . . . . where economy and performance are vital factors . . . . BRIGGS is on the job.

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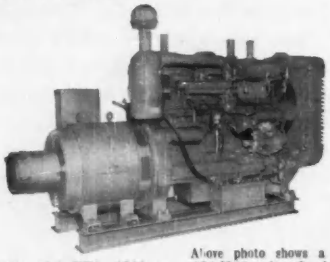
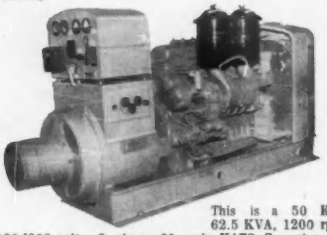
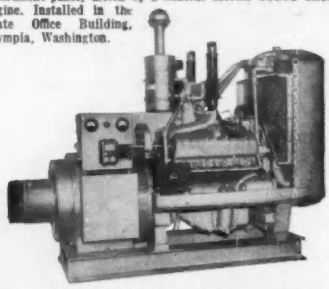


Above photo shows a 50 KW, 62.5 KVA, 1200 rpm, 120/208 volts, 3 phase, 60 cycle KATO Generators and instrument panel, driven by an International Model UD-18A diesel engine. Installed for the Mechanical Construction Division in Salt Lick, Kentucky.



This is a 50 KW, 62.5 KVA, 1200 rpm, 120/208 volts, 3 phase, 60 cycle KATO Generator and instrument panel, driven by a General Motors 6030C diesel engine. Installed in the State Office Building, Olympia, Washington.



This pictures a 75 KW, 93.5 KVA, 1800 rpm, 240 volts, 3 phase, 60 cycle KATO Generator and instrument panel, driven by an H-540 LeRoi engine utilizing natural gas for fuel. Installed for Republic Steel Corporation of Gary, Ind.

An illustration of KATO's versatility: A 350 watt KATO Generator driven by a Lauson LMH engine and a 150 KW, 187.5 KVA, 750 rpm, 120/208 volts, 3 phase, 25 cycle KATO Generator and instrument panel—driven by a General Motors twin 6-71 diesel engine. For Duluth, Mesabi & Iron Range Railway.

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news of our industry

Hot Tracers Test Engine Wear

Radioactive tracers are being used more and more in automotive research, the first Nuclear Engineering and Science Congress was told in Cleveland recently. In a technical paper by a Southwest Research Institute team, it was pointed out that radioactive tracer techniques permit a sensitive and quick measure of engine wear that can't be done by using any other known method.

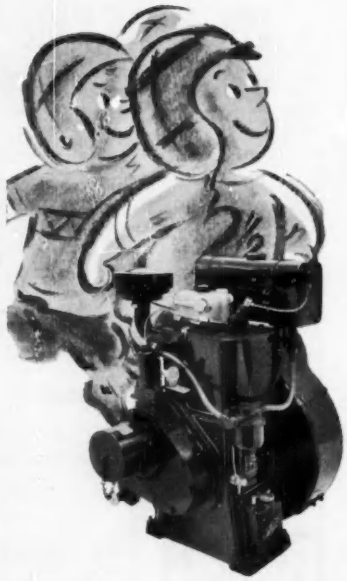
This new tool was used to measure engine deposits as thin as ten millionths of an inch, a research team from California Research Corp. further announced. Also deposition rate can be indicated after only a few hours compared to tens or hundreds by conventional means. Metal transfer between electrical contacts has also been accurately measured, C. R. Lewis of Chrysler revealed. The technique is so accurate, he declared, that a teaspoonful of radioactive salt dissolved in Lake Erie could be detected and measured.

The technique essentially consists of activating an engine part in a nuclear reactor and then assembling it into an engine. As the engine is operated, any change (or wear) in the original part can be detected by a geiger counter. Variations obtain different types of data.

B-W Starts Research Center

Construction of the first unit of a multi-million-dollar research center has begun in Des Plaines, Ill. for the Borg-Warner Corp. It is conceived as one of the most highly diversified establishments for technological advancement in the country.

The center will contain all the newest and most modern types of equipment for testing, analyzing, and evaluating new materials, systems, processes, and products. It will house a complete machine and model shop, a computation center, and a large technical reference library. About 100 scientists and engineers will be engaged at the start of operation. The initial unit is expected to be completed by next spring.



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news of our industry

New Technique Ups Lifter Life

General Electric Co. announces that it has developed a brazing technique to join cemented carbide to valve lifters which has enabled Mack Trucks not only to increase bus and truck engine power output, but to extend lifter life by thousands of miles. Perfecting the joining method, still secret, enabled the company to take advantage of carbide properties.

Performance increase of the valve lifters is said to have risen from 17,000 to as much as 300,000 mi without appreciable wear. It also allowed use of engines with greater cam loads. Application of carbides began when engine power output was increased, resulting in increase in sharpness of nose cams and valve spring loads, which in turn brought about considerable wear and galling on the lifter face.

GE Carbology Dept. engineers developed a carbide disk which met the engine requirements. Initial tests of the carbide, Grade 779, boosted lifter mileage to as much as 150,000, but the problem of joining the disk was not licked until recently. Use of the carbide-faced lifters by Mack, the company states, improves lifter performance as well, by burnishing the cam surfaces.

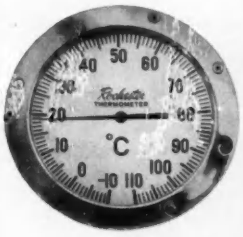
Commercial Filters Expands

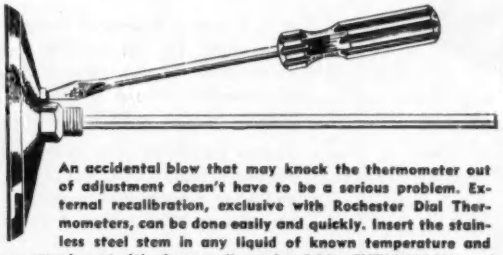
Two Indiana filter companies have been added to Commercial Filters Corp., in accordance with its recent policy to expand its filter lines. The new acquisitions are the filter divisions of Houdaille-Hershey of Indiana, Inc., and Michiana Products Corp. Operation of Michiana, it is contemplated, will be consolidated with the Houdaille-Hershey Div. at Lebanon.

B&M Increases RDC Fleet

Three additional rail diesel cars have been ordered from The Budd Co. by Boston & Maine Railroad. This new order brings to 70 the total number of RDCs operated by the nation's largest user.

EXCLUSIVE! YOU CAN RECALIBRATE THE ROCHESTER DIAL THERMOMETER EXTERNALLY . . . .





An accidental blow that may knock the thermometer out of adjustment doesn't have to be a serious problem. External recalibration, exclusive with Rochester Dial Thermometers, can be done easily and quickly. Insert the stainless steel stem in any liquid of known temperature and adjust the dial with the set screw attachment. It's done easily and quickly, EXTERNALLY, and is completely accurate.

Other plus features include:

All parts, except the crystal, are of corrosion-resistant stainless steel.

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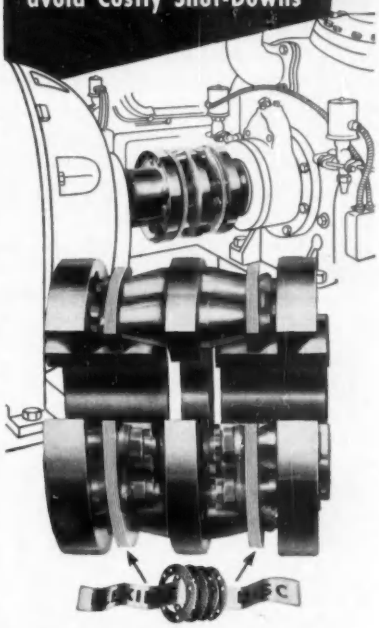
Specify THOMAS ALL METAL FLEXIBLE COUPLINGS for Power Transmission to avoid Costly Shut-Downs



Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.

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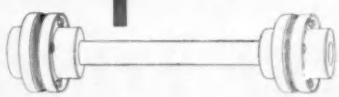
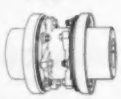
FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.





Thomas Couplings are made for a wide range of speeds, horsepower, shaft sizes and can be assembled or disassembled without disturbing the connected machines, except in rare instances.

Write for new Engineering Catalog No. 51A

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news of our industry

Municipal Adds Gas Turbine

The city of Larned, Kans. has installed what is believed to be this country's first gas-turbine power plant in municipal generation. Supplied by Westinghouse Electric Corp., the 1250-kw unit is completely self-contained requiring no boiler or other external heat source. It burns fuel and converts the heat energy into electricity in a single assembly.

The turbine operates at 8750 rpm and is connected by single-reduction, double-helical gear to a 1563-kva generator going at 200 rpm. In full operation, 28,000 cfm of air is drawn by the axial air compressor and compressed to 53 psig. Fuel burned in the combustion chambers heats the compressed air to 1250° F. This hot gas expands through the gas turbine, which changes the heat to mechanical energy to drive both the air compressor and electric generator. Gases are exhausted at 780° F.

The unit is an open-cycle type weighing 41,000 lb, and is equipped with a dual-fuel system. It is said to be the first of its kind in the U. S. for generating electric power which can change over under load from either gas to liquid fuel, and back again, with no effect upon load. Westinghouse claims that it is less expensive overall and requires less space than a comparable engine plant or steam-electric unit. It operates without cooling water, using cooling air supplied from motor-driven axiflow fans controlled by a thermostatic switch in the lubricating oil piping.

Develop Sound Absorber

You may soon be abe to ride in a soundproof automobile and airplane. That's the prediction of Mones E. Hawley of RCA, made at the recent National Noise Abatement symposium in Chicago where he discussed development of an electronic sound absorber.

He described it as a device consisting of a microphone, amplifier, and loudspeaker, connected to form an electro-acoustic feedback system that reduces pressure variations in the vicinity of the microphone. Possible applications other than soundproofing vehicles, are to reduce machinery noise in the vicinity of the operator's head, and to reduce general room noise as a muffler on an exhaust pipe.

Kewanee-Ross Divisionalized

American Radiator & Standard Sanitary Corp. has dissolved the Kewanee-Ross Corp., its wholly-owned subsidiary, to form two new divisions. Ross Heat Exchanger Div. has been formed to conduct all heat exchanger operations, and Kewanee Boiler Div. established to conduct steel boiler activities.

Officers of the new Ross Heat Exchanger Div. are John C. Linsenmeyer, president; Richard S. Reade, executive vice president; John W. Gudgel, vice president, sales and marketing; and Townsend Tinker, vice president, engineering research and development. Mr. Linsenmeyer will also continue to serve as president of American Blower Corp., another division of American Standard.

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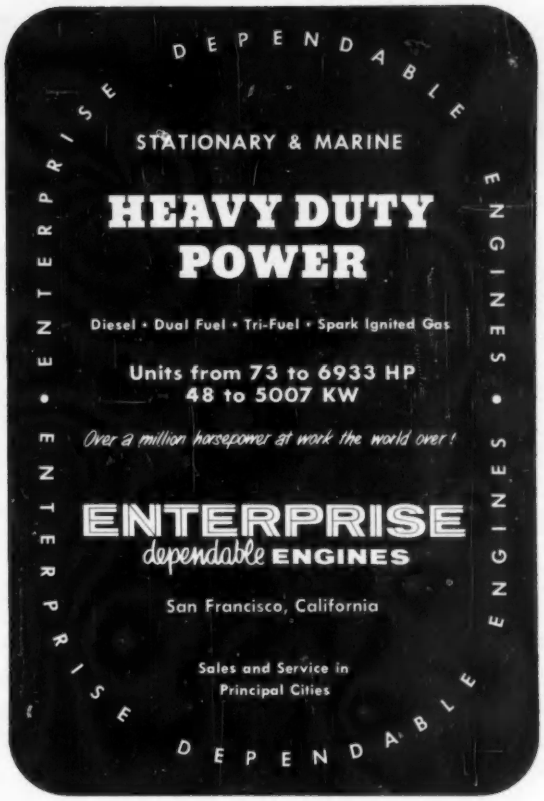
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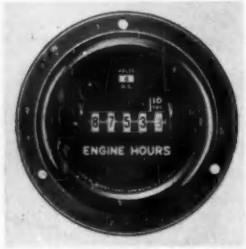

Direct-Reading Hour Meter

Rounding out its meter production, long identified with pointer-type models, John W. Hobbs Corp. has added a direct-reading engine hour indicator to its line. The development comes after years of research and testing in response to demand for a model with the same accurate and dependable timing mechanism used in pointer types.

The new meter is read in much the same way as an automobile odometer. Black figures show total numbers of hours operated; the red figure to the right indicates tenths of hours; and a rotating disc in the upper left part of the face makes one revolution a minute to show that the meter is operating. The meter is available in 6- to 110-v models in three basic types: standard (mounted with three screws), flush (held in place by a stirrup), and aircraft. No increase in price is specified.

Hard-Bladed Phillips Drivers

To eliminate the danger of ruining the tip of a Phillips screw driver when attempting to turn a hardened self-tapping screw, Snap-On Tools Corp. is producing a set of specially hardened drivers with high-grade alloy steel blades. They have been given a special heat treatment for greater wear-resisting qualities and then chrome-plated.

The handles are shock-proof black plastic, said to be practically unbreakable. Their hexagon shape prevents them from rolling when laid down and is also said to provide a powerful turning grip without hurting the hand. There are six tool sizes with blade lengths ranging from 1 to 6 in and blade diam from 3/16 to 6 in.

Ignition-Starter Switch

Designed as a replacement for die-cast key-operated ignition-starter switches is a heavy-duty model produced by Cole-Hersee Co. Called the M-550, it has a removable tumbler and two coded keys, enclosed in a solid brass case to prevent dirt and moisture entry. It is said to be ideally suited to industrial, marine, and earth-moving equipment.

The brass bushing accommodates panels up to 3/4-in thickness. On, off, and start positions are contained, with automatic self-return from the spring-loaded start position when pressure on the key is released. Three large diameter terminals and heavy-duty contacts provide electrical connections. Tumbler face, hex-face nut, and panel washer are chromium plated, and the tumbler is pin-locked into the bushing.

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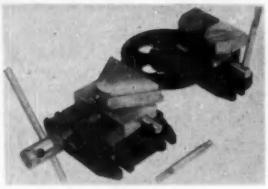

Universal Screw Vise

A larger version of the SEVO vise, that clamps around tapered or irregular objects, is being distributed by De Wilde-Jones Inc. Its jaws consist of a series of machined flat plates which hinge or swivel in any direction to coordinate with the shape of the held object. By turning the main screw, the jaws position themselves and may then be locked.

The new version has two part construction to make it suitable for larger objects. The line now has jaw capacities ranging from 1⅛ in, 2½ in, and 5 in.

90-Ton Mover

Mighty Mover is the tradename of a new type of dolly, which in a set of four is claimed capable of moving 90 tons in a matter of hours. Each unit has two 4-in roller-bearing cast iron wheels enclosed in steel side plates, and a top swivel plate with a standard ½-in threaded hole to which machinery is bolted after being raised with a jack or fork lift.

After machinery is secured it is simply pushed to its new location or moved with a pry bar. Moving on or off trucks is accomplished over channel iron tracks. The movers have a 360-deg turning radius and each is 9-in long, 5-in wide and high, and weighs 40 lb.

Split Flange Hose Fittings

Aeroquip Corp. states it now has a complete line of 4-bolt split flange-type hose fittings available in straight, 45- and 90-deg assemblies, and designed for use with its single-wire and double-wire braid hose. Featuring ease of positioning in installations and rapid disassembly, they conform with SAE specifications and come in all sizes from ½-in through 2-in.

What Do You Know!

(*Answers to Questions on Page 47*)

1. Correct answer is "c". Dispersancy is the ability of an oil to keep soot particles, etc., in suspension so that they will not settle out in various parts of the engine. See article on Page 44.

2. Correct answer is "c". Low oil temperatures in this type of service can't drive off "traces" of water from condensation, Leaky gaskets or cracked liners result in a lot of water, not a "trace". See Page 44.

3. Correct answer is "c". Although engine water temperature may be normal thanks to thermostats, oil temperature and other general engine temperatures take more time to stabilize. See article on Page 44.

4. Correct answer is "a". Of course this varies with the bus service and conditions involved. A good accepted average is 2000 mpg. See article on Page 44.

5. Correct answer is "a". Two-cycle natural gas engines have been turbocharged. Also, 2-cycle diesels have been turbocharged in Europe and Kahlenberg has introduced them here. See Page 26.

6. Correct answer is "a". The turbine breaks up the sharp exhaust slug pressure fronts, and gases are released more smoothly at lower average pressures. See Page 30.

7. Correct answer is "b". Design improvements have reduced fuel consumption of modern dual-fuel engines to a range around this low figure. For an example of such an operation, see Page 33.

8. Correct answer is as follows. Oil preservative is most easily run through a fuel gallery. Separations between gear teeth are easily filled with plastic which holds well. The "short" block can most simply and best be wrapped with paper which gives off vapor. See Page 48.

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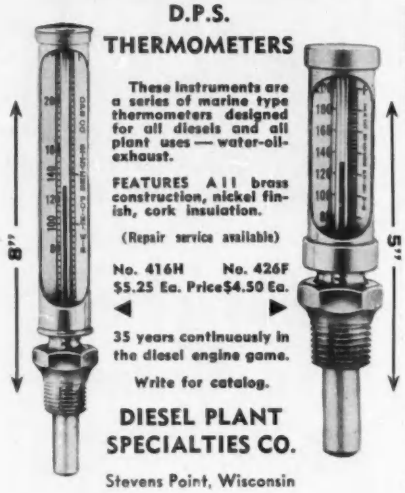

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new products

Self Locking Male Threads

A patented feature of its aircraft turnbuckles — self-locking male threads — has now been applied by Starloc, Inc. to conventional bolts, screws, and studs. It is said to eliminate the need for cotter pins, lockwashers, locknuts, and the like.

Locking action is achieved by a convex fiber insert in the thread of the bolt, so formed as to permit easy insertion and insure locking action along the entire length of the insert, against the nut or female thread. This action does not require high torque or special tools, it is claimed, and may be used with standard nuts, plate nuts, or tapped holes. The threads, it is further claimed, are distortion free and can be repeatedly removed and replaced without loss of locking torque and without galling.

New Mack Dumper

For heavy dumper work up to 8-yd struck capacity, Mack Motor Truck Corp. has introduced the B-61X, powered by a Mack Thermodyne END-673 diesel of 170 hp. Rated 46,000-lb GVW, it has a 158½-in wheelbase adapted to 10- or 11-ft dump bodies. A choice of 5-speed, direct-in-fifth transmission as standard, or Duplex 9-speed overgeared is offered.

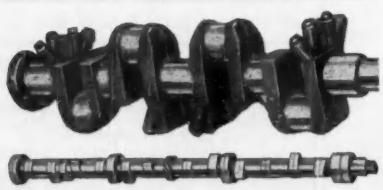
Rear axles are dual-reduction units equipped with radius rods and torque arms. The service brakes are air-actuated with total area of 710 sq in, rear drums 17¼ by 6 in. Hand brake is the internal-expanding type, located on the transmission tailshaft. The cab and entire front-end assembly are unitized as an independent structure, supported from the frame by rubber to immunize against frame flexures on uneven ground. Driver comfort has been emphasized.

New Viscometer

Immediate and consistently accurate readings are claimed obtainable with a Type 11 viscometer, said to be the first of its kind ever developed for directly determining the kinematic viscosity of fuels, light oils, and non-corrosive liquids. Ranges are 0.5 to 5 and 3 to 30 centistokes.

Commercial Research Laboratories, its designers, say that it should be effective with used lube oils. We queried them on this point to learn if the meter would indicate extent of fuel dilution (knowing viscosity of non-diluted oil), and thus reveal if the oil is suitable for further use. Viscosity is read directly in centistokes by flowing a sample through the instrument.

The Type II is supplied as a portable unit for laboratory or field use, or as a panel-mounted unit for either new or existing test equipment. It weighs 8-lb maximum, including thermometer, filter, filter cartridge, and AN outlet fittings. No special operating skill is said to be needed.



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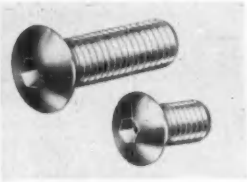

Button Head Socket Screws

Extending its line of fasteners, The Bristol Co. has added a full size range of button head hex socket screws. Ideal for applications which require a smooth headed fastener for pleasing appearance, safety, or tight clearances, they range from No. 4 wire size to 5/8-in diam, with a variety of lengths in all. They are made of heat-treated alloy steel.

Vibration Wave Analysis

Where complex vibrations are present, simplified and highly accurate vibration wave analysis is now possible, International Research & Development Corp. announces. Use of a newly developed Model 1064 continuously variable filter in combination with its vibration analyzer, the company states, permits observation or recording of actual displacement caused by mechanisms rotating at the same frequency to which the filter is tuned.

The combination provides direct reading of displacement of one or all vibration frequencies in the mechanism, by tuning the filter to the desired frequency or by scanning the vibration frequency spectrum. Tuning range of the filter is from 500 to 50,000 cpm.

Ultrasonic Flowmeter

Fischer & Porter Co. is introducing a flowmeter which is claimed to accurately measure either mass or volume of flow of virtually any fluid regardless of its electrical conductivity and without being affected by accompanying variables. Pressure drop is said to be practically zero.

Rate of volume flow is measured by two transducers, each of which transmits and receives controlled pulses of ultrasonic energy across the pipe section it is built into—one diagonally upstream and the other diagonally downstream—to sense the difference in number of impulses received. To convert the instrument to a mass flowmeter, a third transducer, acting alone, may be added.

Wire Joint and Terminal Kit

An assortment of wire joint connectors and terminals and an installing tool are contained in a pocket-size kit being marketed by Thomas & Betts Co., Inc. According to the manufacturer, this is the first time that pressure terminals and pigtails have been made available in the same package.

The kit can be used for terminating and splicing all conductors from No. 20 to No. 10 AWG inclusive. Each connector is installed by simply staking its barrel on a wire end. A quick squeeze of the tool bonds wire and connector together for a mechanically strong joint with low electrical resistance. The stake mark runs parallel to the wire's length, serving as a quick check of a good joint.

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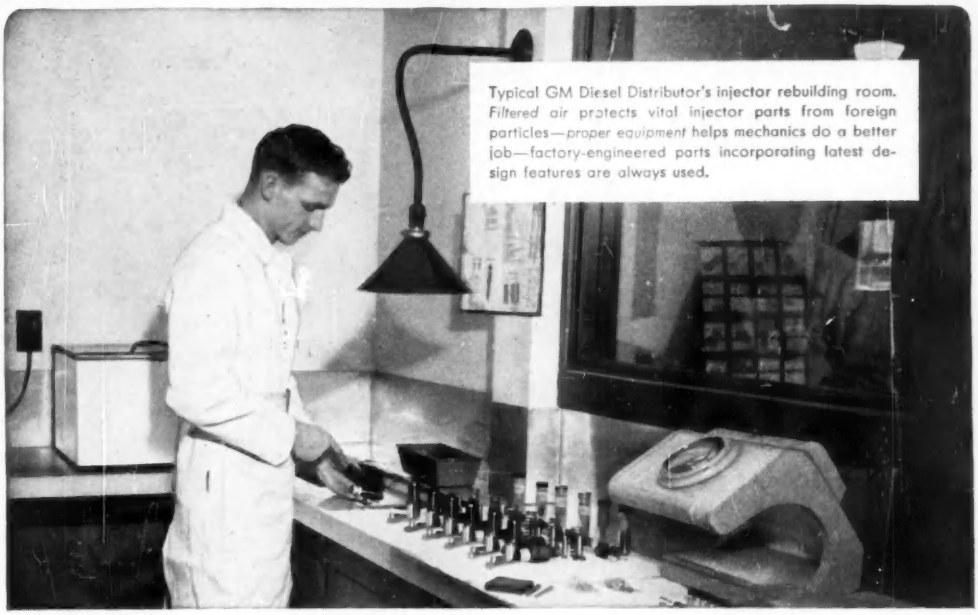

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